NUCLEAR ENGINEERING CALCULATION COVER SHEET

NEPM-QA-0221-1

1. Page 1 of 485
Total Pages 487

➢2. TYPE: CALC ➢3. NUMBER: EC-RADN-1129 ➢4. REVISION: 2

*➢5. UNIT 3 *➢6. QUALITY CLASS: Q

➢7. DESCRIPTION: DBA-LOCA Total Control Room Dose

8. SUPERSEDED BY: NA

9. Alternate Number: NA 10. Cycle: NA

11. Computer Code/Model used: MicroShield 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).

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[1] For Fire Protection related calculations see Section 7.4.3.14 for additional qualification requirements

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CALCULATION REVISION DESCRIPTION SHEET

NEPM-QA-0221-2

REVISION NO: 2	CALCULATION NUMBER: EC-RADN-1129

☐	FULL REVISION	☐	SUPERSEDED
☒	PAGE FOR PAGE	☐	VOIDED

Revised Pages	Add	Rpl	Rmv	Description of Revision on the Listed Pages
Cover page	☐	☒	☐	
Pages 1a and 1b	☐	☒	☐	Add Revision 2 description
4	☐	☒	☐	Update doses
6	☐	☒	☐	Update doses from EC-RADN-1125.
16	☐	☒	☐	Add note qualifying containment direct doses.
17, 18, 19,20, 21, 24, 36	☐	☒	☐	Update doses. Revise page numbering.
37	☐	☒	☐	Update reference 6.3
46, 47, 50, 51, 52, 53, 54, 55, 56, 57, 60, 61, 62, 63	☐	☒	☐	Revise activity sources.
65, 66, 67, 68, 69	☐	☒	☐	Revise doses.
98	☐	☒	☐	Add note qualifying containment direct doses.
138 - 290	☐	☒	☐	Revise MICROSHIELD computer code runs.
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TECHNICAL CHANGE SUMMARY PAGE

NEPM-QA-0221-5

Calculation Number: EC-RADN-1129 **Revision No.** 2

This form shall be used to (1) record the Technical Scope of the revision and (2) record the scope of verification if the calculation was verified. It should not be more than one page. Its purpose is to provide summary information to the reviewer, verifier, approver, and acceptor about the technical purpose of the change. For non-technical revisions, state the purpose or reason for the revision.

Scope of Revision: Revision 2 updates the calculation to incorporate changes in the CRHE doses due to increasing the secondary containment bypass leakage rate limit to 15 scfh.

Scope of Verification (If verification applies): Verify design input, assumptions, methodology, arithmetic, computer code input/output, results and conclusions changes.

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.
Date 08/31/2005
Designed By T.F. Mackay
Checked By M.M.Waselus

PROJECT
DBA-LOCA Total Control Room Dose

Calc. No. EC-RADN-1129
Sh. No. 2

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1.0 OBJECTIVES

The purpose of this calculation is to evaluate a total DBA-LOCA control room dose. This analysis includes control room doses from the following DBA-LOCA radiation sources:

- Contamination of the control room atmosphere by the intake or infiltration of the radioactive material contained in the radioactive plume released from the facility,
- Radiation shine from the external radioactive plume released from the facility,
- Contamination of the control room atmosphere by the intake or infiltration of airborne radioactive material from areas and structures adjacent to the control room envelope,
- Radiation shine from radioactive material in buildings adjacent to the control structure; includes containment, reactor building and turbine building,
- Radiation shine from radioactive material in systems and components inside or external to the control room envelope, e.g., piping, components and radioactive material buildup in HVAC filters.

2.0 CONCLUSIONS AND RECOMMENDATIONS

The dose acceptance criterion for the control room under accident conditions is given in 10CFR50.67(b)(2)iii and is 5 Rem total effective dose equivalent (TEDE) for the duration of the accident. The calculated Control Room Habitability Envelope dose for areas requiring continuous occupancy post-accident are as follows and are within the regulatory limit:

Control Structure Elevation 729'-1" (All areas except Rooms C-401 & C-402, includes Main Control Room)	4.11 Rem TEDE
Control Structure Elevation 741'-1" (All areas except Rooms C-413 and C-414, includes Technical Support Center)	4.11 Rem TEDE
STA Office (Room C-401), Operational Support Center (Room C-402), Electrical Equipment Room (Room C-413), NRC conference room (Room C-414); Elevations 729'-1" & 741'-1"	4.79 Rem TEDE
Computer Room (Room C-202), Elevation 698'-0"	4.11 Rem TEDE

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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 in this calculation are based on a reactor core thermal power of 4032 MWt.

3.2 All DBA-LOCA control room doses are based on full implementation of Alternate Source Terms as defined in USNRC Regulatory Guide 1.183 (Reference 6.1). Per Regulatory Guide 1.183, the following DBA-LOCA dose contributors are included in this analysis:

- Contamination of the control room atmosphere by the intake or infiltration of the radioactive material contained in the radioactive plume released from the facility,
- Radiation shine from the external radioactive plume released from the facility,
- Contamination of the control room atmosphere by the intake or infiltration of airborne radioactive material from areas and structures adjacent to the control room envelope,
- Radiation shine from radioactive material in buildings adjacent to the control structure; includes containment, reactor building and turbine building,
- Radiation shine from radioactive material in systems and components inside or external to the control room envelope, e.g., piping, components and radioactive material buildup in HVAC filters.

3.2 The control room habitability envelope (CRHE) is defined in SSES FSAR Figure 6.4-1A (Reference 6.2.a). Floor plans of the control structure are given in the Reference 6.2.b and 6.2.c drawings. The areas located inside the control structure habitability envelope include the following rooms: Control Room, Technical Support Center (TSC), Operational Support Center (OSC), computer, relay, cable spreading and HVAC and battery rooms for both Units 1 and 2.

The control room habitability envelope is designed with adequate radiation protection to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of specified values. Although all areas of the control structure envelope are designed for habitability following a DBA-LOCA, not all areas inside the envelope require continuous occupancy. The following areas inside the control structure are designated as requiring continuous occupancy following a DBA-LOCA:

Control Structure Elevation 729'-0" (All areas)
Control Structure Elevation 741'-1" (All areas)
Computer Room (Room C-202) at Elevation 698'-0"

DBA-LOCA doses for these three areas are evaluated assuming that continuous occupancy as defined in RG 1.183 is required.

Post-accident doses for areas not continuously occupied in the control structure are also evaluated. These results can be used to evaluate post-accident exposures to these areas on a case-by-case basis for frequent or infrequent occupancy or access, if required post-accident.

3.3 The DBA-LOCA control room and offsite doses from the radioactive plume are evaluated in EC-RADN-1125 (Reference 6.3). The CRHE dose due to contamination of the atmosphere by the intake or infiltration of the radioactive material contained in the radioactive plume is 3.94 Rem TEDE. The CRHE dose due to direct shine from the DBA-LOCA external radioactive plume released from the facility is 0.0495 Rem EDE. The direct shine dose from control structure elevation 806'-0"airborne is 0.0435 Rem EDE on elevation 783'-0" of the CRHE and is negligible on all CRHE elevations below 783'-0".

In addition to doses from the radioactive effluent plume, DBA-LOCA activity sources are also obtained from EC-RADN-1125. This includes airborne activity inside containment and the reactor and turbine buildings, activity in the suppression pool and activity buildup on the SGTS filter.

The following activity sources are obtained from EC-RADN-1125, Appendix A:

a. DBA-LOCA Primary Containment Airborne Activity (EC-RADN-1125, Table A-11)
b. DBA-LOCA Suppression Pool Activity (EC-RADN-1125, Table A-7)
c. DBA-LOCA Reactor Building Airborne Activity (EC-RADN-1125, Table A-5; Includes both containment leakage and ESF leakage DBA-LOCA activity transport paths)
d. DBA-LOCA Turbine Building Airborne Activity (EC-RADN-1125, Table A-10; Includes both bypass leakage and MSIV leakage DBA-LOCA activity transport paths)
e. Activity Buildup On Standby Gas Treatment System Filter For DBA-LOCA (EC-RADN-1125, Table A-6; Includes both containment leakage and ESF leakage DBA-LOCA activity transport paths)

Source volumes used in the EC-RADN-1125 dose analysis for these sources are as follows:

Suppression Pool Water Volume = 132,000 ft^3
Drywell Free Volume = 239,600 ft^3
Wetwell Free Volume = 148,590 ft^3
Total Primary Containment Free Volume = 388,190 ft^3

Reactor Building (Zone I & III Isolation) = 4,156,600 ft^3 ; with 50% mixing = 2,078,300 ft^3
Reactor Building (Zone I, II, III Isolation) = 5,755,200 ft^3 ; with 50% mixing = 2,877,600 ft^3

3.4 The DBA-LOCA activity source terms used in calculation EC-RADN-1125 for the effluent plume 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. 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. An analysis is given in EC-RADN-1135 (Reference 6.5) which evaluates the use of these same 60 isotopes for direct shine dose calculations. Results of EC-RADN-1135 show that use of the RADTRAD 60 isotope model for direct shine doses require correction factors to account for the isotopes not considered. These correction factors are based on time post-accident and on source material and thickness of radiation shielding material.

The 60 dose significant RADTRAD 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 08/31/2005
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PROJECT
DBA-LOCA Total Control Room Dose

Calc. No. EC-RADN-1129
Sh. No. 8

Dose correction factors for the RADTRAD 60 isotope source term are obtained from EC-RADN-1135 and 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)	Direct Shine Dose Correction Factor 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)	Direct Shine Dose Correction Factor 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

AST LIQUID SOURCES - COMPARISON OF DIRECT SHINE DOSE RESULTS FOR 183 ISOTOPE AND 60 ISOTOPE RADTRAD AST SOURCES	
Time Post-Accident (hrs)	**Direct Shine Dose Correction Factor 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

3.5 The MICROSHIELD Version 5.01 computer code is used to evaluate direct radiation dose rates. (Reference 6.6)

3.6 The activity release path for DBA-LOCA MSIV leakage is the Isolated Condenser Treatment Method (ICTM). This leakage treatment method takes advantage of the volume in the main condenser to provide hold-up and plate-out of fission products that may leak from closed MSIVs. The condenser is isolated from the turbine building and the outside environment. MSIV leakage that enters the condenser is subsequently released to the turbine building from the low pressure turbine seals (Reference 6.8, Volume 2, Section 4.3.1.1). The turbines are located on the turbine operating deck, elevation 729'-0" of the turbine building. The turbine deck airspace volume is evaluated in EC-033-1011 (Reference 6.7) and is 4,564,350 ft^3. The turbine building DBA-LOCA airborne activity concentration for this evaluation is conservatively calculated assuming no mixing of activity with other areas of the turbine building and conservatively assuming a turbine deck airspace volume of 4,000,000 ft^3.

3.7 A composite overview of reactor/primary containment/reactor building layout is given in the Reference 6.9 design drawings.

3.8 Plant general floor plans and arrangements are given in the Reference 6.10 and 6.11 design drawings.

3.9 Layout and dimensions for the control building floor plans are given in the Reference 6.12 civil drawings.

.10 Layout and dimensions for the reactor building floor plans are given in the Reference 6.13 civil drawings.

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3.11 Consistent with the requirements of Regulatory Guide 1.183, Section 4.2.6 (Reference 6.1), for areas inside the CRHE that require continuous occupancy (See Section 3.2) the dose receptor for these analyses is the hypothetical maximum exposed individual who is present in the control room for 100% of the time during the first 24 hours after the event, 60% of the time between 1 day and 4 days, and 40% of the time from 4 days to 30 days.

3.12 SSES Calculation EC-076-1003 (Reference 6.14) identifies the locations of Post-LOCA contained radiation sources. The scope of EC-076-1003 includes the plant systems that may contain post-LOCA radiation sources as identified in NUREG-0737, Item II.B.2, Plant Shielding. The systems evaluated include HPCI, RCIC, RHR (LPCI), Shutdown Cooling, Suppression Pool Cooling and Containment Spray modes, Core Spray, Main Steam Line drains, Process Radiation Monitoring (Containment Atmosphere Monitoring, Plant Vent Stack Sampling and Post Accident Sampling), instrument lines classified as extensions of primary containment and the H_2O_2 Analyzer System.

3.13 The Standby Gas Treatment System filter assembly unit is shown in SSES drawing FF108710, Sheet 2601 (Reference 6.15). The following data is obtained:

a. Overall dimensions of the High Efficiency Charcoal Adsorber (HECA) filter unit are:
   Height = 8'-1½"
   Width = 9'-1½".
   Depth = approximately 5 ft

b. Weight of charcoal in the HECA filter unit = 6920 lb @ 28 lb/ft^3

3.14 Piping specifications are obtained from SSES Drawing A106304 (Reference 6.17) and are as follows:

a. 12 " and 14" GBB -- 0.375" nominal wall
b. 10" GBB -- Schedule 40

3.15 Pipe data and dimensions are obtained from Reference 6.18 and are as follows:

a. 12" pipe, 0.375" nominal wall
   Inside diameter = 12 in; Radius = 12 in /2 = 6 in
   Wall thickness = 0.375 in

b. 14" pipe, 0.375" nominal wall
   Inside Diameter = 13.250 in; Radius = 13.250 in / 2 = 6.625 in
   Wall thickness = 0.375 in

c. 10" Schedule 40 pipe
   Inside Diameter = 10.02 in; Radius = 10.02 in / 2 = 5.01 in
   Wall thickness = 0.365 in

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4.0 METHODOLOGY

The total DBA-LOCA control room dose consists of the sum of the doses from the following DBA-LOCA radiation sources:

- Contamination of the control room atmosphere by the intake or infiltration of the radioactive material contained in the radioactive plume released from the facility.
- Radiation shine from the external radioactive plume released from the facility.
- Contamination of the control room atmosphere by the intake or infiltration of airborne radioactive material from areas and structures adjacent to the control room envelope.
- Radiation shine from radioactive material inside containment.
- Radiation shine from radioactive material inside the reactor building.
- Radiation shine from radioactive material inside the turbine buildings.
- Radiation shine from radioactive material in systems and components inside or external to the control room envelope, e.g., piping, components and radioactive material buildup in HVAC filters.

Direct shine doses are evaluated using the MICROSHIELD computer code and DBA-LOCA activity source terms obtained from EC-RADN-1125. Dose correction factors for use of the 60 isotope RADTRAD source term are applied.

A log-log integration of dose rate versus time is performed to determine the 30 day integrated control room dose.

The following areas inside the control structure are designated as requiring continuous occupancy following a DBA-LOCA:

Control Structure Elevation 729'-0" (All areas)
Control Structure Elevation 741'-1" (All areas)
Computer Room (Room C-202) at Elevation 698'-0"

DBA-LOCA doses for these three areas are evaluated assuming that continuous occupancy as defined in RG 1.183 is required.

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Post-accident doses for areas not continuously occupied in the control structure are also evaluated. These results can be used to evaluate post-accident exposures to these areas on a case-by-case basis for frequent or infrequent occupancy or access, if required post-accident. The doses for these areas take into account the RG 1.183 occupancy factors. Results can then be adjusted for the actual access or occupancy requirements.

4.1 DBA-LOCA Activity Source Terms

DBA-LOCA activity source terms in Curies as a function of time post-accident are obtained from EC-RADN-1125. For ease of input into the MICROSHIELD computer code, the EC-RADN-1125 DBA-LOCA activity sources were sorted alphabetically by nuclide and are given in the following Tables:

Table 1. DBA-LOCA Primary Containment Airborne Activity
Table 2. DBA-LOCA Suppression Pool Activity
Table 3. DBA-LOCA Reactor Building Airborne Activity
Table 4. DBA-LOCA Turbine Building Airborne Activity
Table 5. Activity Buildup On Standby Gas Treatment System Filter For DBA-LOCA.

DBA-LOCA activity source concentrations in μCi/cc are evaluated by dividing the Table 1 through 4 activity sources by the appropriate source volumes and converting units to microcuries and cubic centimeters. An activity concentration source term for the SGTS filter is not required. The following volumes are used (See Sections 3.3 and 3.6):

Suppression Pool Water Volume = 132,000 ft^3
Primary Containment = 239,600 ft^3 (Conservatively assume drywell mixing only)
Turbine Building = 4,000,000 ft^3
Reactor Building Free Volume = 4,156,000 ft^3 / 2 = 2,078,000 ft^3 (conservatively assuming Zone I & III isolation with 50% mixing)

DBA-LOCA activity concentrations for primary containment, the suppression pool and the reactor and turbine buildings are given in the following tables:

Table 6. DBA-LOCA Primary Containment Airborne Activity Concentration
Table 7. DBA-LOCA Suppression Pool Activity Concentration
Table 8. DBA-LOCA Reactor Building Airborne Activity Concentration
Table 9. DBA-LOCA Turbine Building Airborne Activity Concentration

4.2 Integration Of DBA-LOCA Direct Shine Dose Rates

Since DBA-LOCA dose rate as a function of time post-accident changes exponentially and since the post-accident time intervals used in this analysis were selected to ensure that a linear approximation may be used to represent the dose rate between adjacent time interval data points, i.e. data points (t_1, d_1) and (t_2, d_2), a log-log integration of dose rate versus time is performed to determine 30 day integrated doses. Thus,

$$\ln(d) = A_1 + A_2 \ln(t)$$

where :

d_1 = dose rate at time t_1

d_2 = dose rate at time t_2

$$A_1 = \frac{\ln(t_2)\ln(d_1) - \ln(t_1)\ln(d_2)}{\ln(t_2) - \ln(t_1)}$$

$$A_2 = \frac{\ln(d_2) - \ln(d_1)}{\ln(t_2) - \ln(t_1)}$$

Solving for d yields:

$$d = e^{A_1} t^{A_2}$$

Integrating d with respect to t gives:

$$D = \int_a^b d\,dt$$

$$D = \frac{e^{A_1}}{A_2 + 1}\left[b^{A_2+1} - a^{A_2+1}\right]$$

The integrated dose D over successive time intervals is calculated using the above methodology and the results summed to obtain the 30 day integrated dose. Direct shine dose correction factors for the 60 isotope RADTRAD source are applied to MICROSHIELD calculated dose rates prior to integration. Regulatory Guide 1.183 occupancy factors (See Section 3.11) are applied to the appropriate time step integrated doses prior to summing integrated doses over 30 days.

4.3 Evaluation Of Dose Due to Intake Or Infiltration Of Radioactive Material Contained In The Effluent Plume

The DBA-LOCA control room and offsite doses from the radioactive plume are evaluated in EC-RADN-1125 (Reference 6.3). The control room dose due to contamination of the control room atmosphere by the intake or infiltration of the radioactive material contained in the radioactive effluent plume is 3.93 Rem TEDE.

4.4 Evaluation Of Dose Due To Radiation Shine From The Radioactive Effluent Plume

The direct shine to the control structure from the post-LOCA external radioactive plume is evaluated in EC-RADN-1125 (Reference 6.3) and is 0.0515 Rem EDE. The direct shine into the CRHE from airborne activity in control structure elevation 806'-0" is also evaluated in Reference 6.3 and is 0.0454 Rem EDE on CRHE elevation 783'-0".

4.5 Evaluation Of Dose Due To Contamination Of The Control Room Atmosphere By The Intake Or Infiltration Of Airborne Radioactive Material From Areas And Structures Adjacent To The Control Room Envelope

In December of 2004, tracer gas inleakage tests were performed on the CRHE by Lagus Applied Technology, Inc. and NCS Corporation. Air inleakage rate into the CRHE was determined with the Control Room Emergency Outside Air Supply System (CREOASS) operating in two filtered emergency pressurization modes (A and B train).

As stated in the report provided by Lagus Applied Technology, Inc. and NCS Corporation, statistically, the inleakage value for both tests is zero, since the values lie within the 95% uncertainty limits. Conservative methodology recommends that the 95% upper confidence limit values be assumed for CRHE inleakage rate.

The infiltration rate to the control structure for design basis accident analysis is assumed to be 500 scfm at the Control Room intake, plus an additional 10 scfm attributed to leakage through improperly sealed doors or by personnel ingress and egress.

Since the tracer gas inleakage tests statistically yielded a CRHE infiltration rate of zero, it was determined that the most likely entry point of inleakage is at the CRHE intake. Consequently, the inleakage and intake χ/Qs are the same. Therefore, there is no inleakage or infiltration of airborne radioactive material from areas and structures adjacent to the control room envelope.

4.6 Evaluation Of Radiation Dose Due To Shine From Containment

The layout of the control structure with respect to primary containment is shown in the Reference 6.9, 6.10 and 6.11 plant design drawings. It can be seen that there is a direct shine dose contribution to the control structure from primary containment DBA-LOCA airborne and surface plateout activity. The control structure is shielded from primary containment DBA-LOCA sources by the 6 ft thick concrete primary containment wall and the 3 ft thick concrete wall located between the control structure and reactor building at Column Line P. The direct shine dose to the control structure from primary containment is conservatively based on source-receptor dimensions obtained at plant elevation 729'-1". Per Reference 6.9.c, since the primary containment wall slants away from the control structure, using dimensions at 729'-1" conservatively minimizes the distance from the primary containment airborne source to areas inside the control structure that require continuous occupancy. Also, the control room is actually located on elevation 729'-1" of the control structure.

The direct shine dose rates inside the control structure are evaluated using Unit 1 source-receiver geometry. Since the source-receiver geometry for Unit 2 is the same as Unit 1, the containment shine dose results are applicable to both units.

The dose receptor point inside the control structure is at the minimum distance between the control structure and primary containment (For Unit 1, this is at the northeast corner of the control structure). Using dimensions obtained from the Reference 6.10.j, 6.11.d and scaling distances from Reference 6.9.c, the source-receptor geometry for direct shine to the control structure from primary containment is shown in Figure 1.

The MICROSHIELD computer code is used to evaluate dose rate inside the control structure as a function of time post-accident. Primary containment is conservatively modeled as an equivalent cylinder-shield at side using dimensions obtained at plant elevation 729'-1". The equivalent source height is calculated based on the primary containment inside radius of 35.75 ft at elevation 729'-1" and a drywell free volume of 239,600 ft^3. Using the data given in Figure 1, the MICROSHIELD model is as follows:

MICROSHIELD MODEL - Primary Containment

Geometry 7 - Cylinder Volume - Side Shields
Height = 59.67ft
Radius = 35.75 ft
Wall Clad = 0
X = 59.52 ft
Y = Height / 2 = 59.67 ft / 2 = 29.835 ft
Z = 0
Activity Source: Table 1
Source Material: air
Shield: 9.36 ft concrete (sum of 6.36 ft equivalent primary containment shield wall + 3 ft control structure wall; slant path through control structure wall conservatively neglected)
Buildup: concrete

The MICROSHIELD Version 5.01 computer code outputs for the containment direct shine dose analysis are given in Attachment 3. These dose rates and the analysis of the 30 day TID dose using the log-log integration methodology given in Section 4.2 of this calculation are summarized in Table 10. The maximum direct shine dose rate to the control room occurs at 2 hours post-accident and is 9.3E-04 mr/hr. The 30 day TID to the CRHE is 2.86E-06 Rem. These doses are evaluated without airborne dose correction factors for the 60 Isotope RADTRAD source term since a correction factor for 9.36 ft of concrete was not evaluated in EC-RADN-1135. However, even with a significant airborne dose correction factor for the 60 isotope RADTRAD source, the 30 day direct shine dose to the CRHE from containment will still be negligible (i.e <0.0001 Rem). These doses are applicable to all elevations of the CRHE.

Note: The activity source terms provided in Table 1 are based on a secondary containment bypass leakage rate of 15 scfh (Ref. EC-RADN-1125, Revision 3). Since the change in the containment airborne sources for 15 scfh versus 9 scfh (Reference EC-RADN-1125, Revision 2) was a decrease affecting the third significant digit, the MICROSHIELD code was not re-run for this insignificant change. The MICROSHIELD computer code outputs given in Attachment 3 are conservative for 15 scfh but still reflect a bypass leakage rate of 9 scfh.

4.7 Evaluation Of Radiation Dose Due To Shine From The Reactor Building

The layout of the control structure and the reactor building is shown in the Reference 6.10 and 6.11 plant design drawings. It can be seen that there is a direct shine dose contribution to the control structure from DBA-LOCA airborne activity inside the reactor building. For the case where two reactor building ventilation zones isolate, the reactor building shine dose contribution to the control structure is from one unit only. For the case where three reactor building

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ventilation zones isolate, the reactor building shine dose is from both units. Since the reactor building DBA-LOCA activity concentration given in Table 8 is conservatively based on the minimum reactor building source volume (Zone I & III isolation), the MICROSHIELD model used for this analysis is also based on the dose contribution for Zone I and III isolation. A dose receiver point at Column Line 29 is provided so that the MICROSHIELD dose results can be adjusted to obtain doses for three zone isolation by accounting for the dose contribution from both reactor buildings and the change in the airborne activity concentration.

The control structure is shielded from reactor building airborne activity by the 3 ft thick concrete shield wall between the reactor building and control structure located at Column Line P. Reference 6.10.h shows a cross sectional view of the reactor building and control structure. It can be seen that since the direct shine dose into the control structure is dependent on the reactor building airborne source volume, the dose contribution from each floor elevation does not vary significantly. As a result, a single conservative reactor building source model is used to represent all reactor building floor elevations. It is based on reactor building floor elevation 719'-1" which is also the reactor building dose contributor to the control room on elevation 729'-0" of the control structure. The reactor building source volume is also based on reactor building ventilation two zone mixing and the dose contribution from a single unit. The reactor building airborne source extends from Column Line 26 to 29 in the north-south direction, Column Lines P to U in the east-west direction and is between floor elevations 719'-0" and 749'0". No credit is taken for the shielding effects of reactor building interior concrete walls including the primary containment wall. From References 6.10.h, 6.11.d and 6.13, the reactor building source dimensions are as follows:

Length = Column P to Column U
= 134 ft - 1'-6" concrete a Column P - 1'-6" concrete at Column U
= 131 ft

Width = Column 26 to Column 29 = 63 ft

Height = Floor Elevation 749'-1" - Floor Elevation 719'-1" - 1'-9" floor slab thickness
= 28 ft - 3 in

Since the MICROSHIELD model is for Zone I & III isolation and since Zone I, II & III isolation must also be considered, two dose receptor points inside the control structure are used in the MICROSHIELD single unit model. For the case of Zone I & III mixing and a dose contribution from one unit, the maximum dose rate inside the control structure is at the source centerline (i.e. midpoint between Column Lines 26 and 29). For the case where three reactor building ventilation zones isolate and the shine dose is from both units, the maximum dose rate inside the CRHE is at Column Line 29. The results of the single unit MICROSHIELD model at Column 29 are multiplied by a factor of 2 to obtain the shine dose rate from both units and is then

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corrected for source volume by multiplying by the ratio of zone isolation volumes (2,078,150 / 2,877,600 = 0.722).

The MICROSHIELD computer code is used to evaluate dose rate inside the control structure as a function of time post-accident. The reactor building is modeled as a slab source with shields at side. The MICROSHIELD model is as follows:

MICROSHIELD MODEL - Reactor Building

Geometry 13 Rectangular Volume
Length = 131 ft
Width = 63 ft
Height = 28 ft - 3 in
X = 131 ft + 3ft + 0.5 ft = 134.5 ft
Y = Height / 2 = 28.25 ft / 2 = 14.125 ft
Z = Width / 2 = 63 ft / 2 = 31.5 ft
Activity Source: Table 8
Source Material: air
Shield: 3 ft concrete
Buildup: air (results in highest dose)

The MICROSHIELD Version 5.01 computer code outputs for the reactor building direct shine dose analysis are given in Attachment 4. These dose rates and the analysis of the 30 day TID dose using the log-log integration methodology given in Section 4.2 of this calculation are summarized in Tables 11 and 12. The highest DBA-LOCA reactor building shine dose to the CRHE results for Zone I and III mixing. From Table 11, the maximum direct shine dose rate to the control room occurs at 4 hours post-accident and is 5.43 mr/hr. The 30 day TID to the CRHE is 0.0456 Rem EDE. These doses are applicable to all elevations of the CRHE.

4.8 Evaluation Of Radiation Dose Due To Shine From The Turbine Buildings

The layout of the control structure with respect to the turbine building is shown in the Reference 6.9, 6.10 and 6.11 plant design drawings. It can be seen that there is a direct shine dose contribution to the control structure from DBA-LOCA airborne activity inside the turbine building. DBA-LOCA activity transport pathways into the turbine building are containment leakage that bypasses the reactor building and MSIV leakage. The turbine building DBA-LOCA airborne source obtained from EC-RADN-1125 (See Section 3.3) is based on the sum of the activity from both of these pathways and conservatively neglects any activity loss from the turbine building due to building leakage.

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The activity release path for DBA-LOCA MSIV leakage is the Isolated Condenser Treatment Method (ICTM). This leakage treatment method takes advantage of the volume in the main condenser to provide hold-up and plate-out of fission products that may leak from closed MSIVs. The condenser is isolated from the turbine building and the outside environment. MSIV leakage that enters the condenser is subsequently released to the turbine building from the low pressure turbine seals (Reference 6.8, Volume 2, Section 4.3.1.1). The turbines are located on the turbine operating deck, elevation 729'-0" of the turbine building. The turbine deck airspace volume is evaluated in EC-033-1011 (Reference 6.7) and is 4,564,350 ft^3.

DBA-LOCA bypass leakage is a transport pathway that can result in containment activity leakage bypassing the reactor building. The primary source of this transport path is containment leakage through systems. The most likely release point for this activity transport pathway into the turbine building is through components located on floor elevations below the operating deck.

In order to conservatively evaluate the direct shine dose to the control room from turbine building DBA-LOCA airborne activity, it is assumed that all MSIV and bypass leakage is released to the turbine operating deck. Airborne activity concentrations are conservatively calculated assuming no mixing of activity with other areas of the turbine building and conservatively assuming a turbine deck airspace volume of 4,000,000 ft^3.

The control structure is shielded from DBA-LOCA turbine building airborne sources by the concrete wall located between the two buildings. This wall varies in thickness and provides either 2.5 ft or 3 ft of concrete shielding from turbine building airborne sources. Reference 6.10.h shows a cross sectional view of the turbine building and control structure. It can be seen that the operating deck is the largest turbine building airborne source for shine to the control structure. This is true because other floor elevations are divided into much smaller rooms with internal concrete shield walls. Also, all of the DBA-LOCA turbine building airborne activity is assumed to be on the operating deck.

From References 6.10.d, 6.10.h and 6.7, the turbine building source dimensions are as follows:

Length = Column G to Column N = 163 ft

Height = Elevation 786'-0 - Floor Elevation 729'-0" = 57 ft

Free Volume = conservatively assume 4,000,000 ft^3

Therefore,
Width = 4,000,000 ft^3 / (163 ft x 57 ft) = 430.52 ft

The MICROSHIELD computer code is used to evaluate dose rate inside the control structure as a function of time post-accident. Doses are evaluated for both 2.5 ft and 3 ft concrete shielding between the turbine building and CRHE. The turbine building is modeled as a slab source with shields at side. The MICROSHIELD model is as follows:

MICROSHIELD MODEL - Turbine Building

Geometry 13 Rectangular Volume
Length = 163 ft
Width = 430.52 ft
Height = 57 ft in
X = 163 ft + 2.5 ft + 0.5 ft = 166 ft (for 2.5 ft concrete shield wall)
= 163 ft + 3 ft + 0.5 ft = 166.5 ft (for 3 ft concrete shield wall)
Y = Height / 2 = 57 ft / 2 = 28.5 ft
Z = Width / 2 = 430.52 ft / 2 = 215.26 ft
Activity Source: Table 4
Source Material: air
Shield: 2.5 ft, 3 ft concrete
Buildup: air (results in highest dose)

The MICROSHIELD Version 5.01 computer code outputs for the turbine building direct shine dose analysis are given in Attachment 5. These dose rates and the analysis of the 30 day TID dose using the log-log integration methodology given in Section 4.2 of this calculation are summarized in Tables 13 and 14. The highest DBA-LOCA turbine building shine dose to the CRHE results for 2.5 ft of concrete shielding. From Table 13, the maximum direct shine dose rate to the control room occurs at 8 hours post-accident and is 0.94 mr/hr. The 30 day TID to the CRHE is 0.0169 Rem EDE. These doses are conservatively assumed applicable to all elevations of the CRHE.

4.9 Evaluation Of Radiation Dose Due To Shine From Radioactive Material In Systems And Components Inside Or External To The Control Room Envelope

This dose contribution to the CRHE includes radiation shine from DBA-LOCA radioactive material sources in systems and components inside or external to the control room envelope, e.g., piping, components and radioactive material buildup in HVAC filters.

The only HVAC system filters which contribute to the CRHE post LOCA doses are the Standby Gas Treatment System (SGTS) filters. Per References 6.10.f and 6.10.h, the SGTS filters are located outside the control room habitability envelope on control structure elevation 806'-0" and will result in a direct shine dose contribution to the CRHE. The direct shine dose to the CRHE

from activity buildup on the SGTS is included in this evaluation. The turbine building HVAC system, which has both filtered and non-filtered exhausts, could be operating if offsite power is not lost. However, the shine dose from the effluent plume evaluated in Section 4.4 already evaluates doses from activity released from the turbine building assuming no filtration. Any activity which could buildup on the turbine building HVAC exhaust filter has already been taken into account for CRHE doses in the effluent plume direct shine dose analysis. The CREOAS filter, which pre-treats the outside air makeup to the CRHE, is also located outside the control room habitability envelope on control structure elevation 806'-0". The lower elevations of the CRHE are shielded from the filter assembly by a minimum of 3 feet of concrete. The activity buildup on these filters is expected to be insignificant relative to the SGTS filters and as such the dose contribution to the CRHE from this filter is negligible.

SSES Calculation EC-076-1003 identifies the locations of Post-LOCA contained radiation sources. The scope of EC-076-1003 includes those plant systems that may contain post-LOCA radiation sources as identified in NUREG-0737, Item II.B.2, Plant Shielding. The systems evaluated include HPCI, RCIC, RHR (LPCI), Shutdown Cooling, Suppression Pool Cooling and Containment Spray modes, Core Spray, Main Steam Line drains, Process Radiation Monitoring (Containment Atmosphere Monitoring, Plant Vent Stack Sampling and Post Accident Sampling), instrument lines classified as extensions of primary containment and the H_2O_2 Analyzer System.

The evaluation of radiation doses to the CRHE from contained DBA-LOCA sources is as follows:

4.9.1 Direct Shine Dose From Standby Gas Treatment System Filters

Per References 6.10.f and 6.10.h, the Standby Gas Treatment System filter assembly is located on control structure elevation 806'-0", outside of the CRHE. It consists of both high efficiency particulate absorber (HEPA) and high efficiency charcoal adsorber (HECA) filter units. It can be seen that the maximum direct shine dose into the CRHE from the SGTS filters will be on elevation 783'-0" of the control structure which is the Heating and Ventilation Equipment Room Area. This CRHE area does not require continuous occupancy post-accident. The closest CRHE area requiring continuous occupancy post-accident is elevation 741'-1" which is the location of the Technical Support Center. Direct shine doses to both the H&V Equipment Room and the Technical Support Center are evaluated.

The concrete thickness of control structure floors located between the SGTS filters on elevation 806'-0" and the Technical Support Center at elevation 741'-1" are as follows:

Control Structure Floor Elevation	Concrete Floor (1) Thickness	Reference
806'-0"	3 ft underneath SGTS filters	6.12.g
783'-0"	1 ft	6.12.f
771'-0"	1 ft	6.12.e
754'-0"	1 ft	6.12.c
Note 1: No credit taken for thickness of decking		

It is conservatively assumed for this analysis that all of the SGTS filter activity is contained in the charcoal adsorber unit. This is a conservative assumption since it will concentrate all of the SGTS filter activity into one source volume. The following dimensions and data for the SGTS HECA filter unit is obtained from Reference 6.15 (see Section 3.11)

Overall dimensions of the HECA filter assembly:
Height = 8'-1½"
Width = 9'-1½"
Depth = approximately 5 ft
Weight of charcoal = 6920 lb @ 28 lb/ft^3

The MICROSHIELD computer code is used to evaluate the direct shine dose rate inside the control structure as a function of time post-accident. The SGTS filter is conservatively modeled as a rectangular volume source. The source volume is based on the overall filter dimensions. The volume of the filter is (8'-1½") x (9'-1½") x (5') = 370.7 ft^3 . An equivalent source density for the SGTS filter is calculated as follows:

Overall source volume = 370.7 ft^3 = 1.049E+07 cc
The volume of charcoal in the filter = 6920 lb / 28 lb/ft^3 = 247.1 ft^3 = 6.997E+06 cc
Remaining source volume = 370.7 ft^3 - 247.1 ft^3 = 123.6 ft^3 = 3.500E+06 cc

Conservatively assume that the remaining source volume is 95% air @ 0.00122 gm/cc and 5% steel @ 7.86 gm/cc.

Therefore, equivalent source volume =

((6920 lb x 453.59 gm /lb) + (0.95 x 3.500E+06 cc X 0.00122 gm/cc) +
(0.05 x 3.500E+06 cc x 7.86 gm/cc) / 1.049E+07 cc = 0.43 gm/cc

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.	PROJECT	Calc. No. EC-RADN-1129
Date 08/31/2005	DBA-LOCA Total Control Room Dose	
Designed By T.F. Mackay		Sh. No. 23
Checked By M.M.Waselus		

The MICROSHIELD computer code is used to evaluate direct shine dose rates from the SGTS filters on floor elevation 783'-0". The MICROSHIELD model for floor elevation 783'-0" is as follows:

MICROSHIELD Model SGTS Filters

Geometry 13 Rectangular Volume
Length = 8'-1½" = 97.5 in
Width = 9'-1½" = 109.5 in
Height = 5 ft = 60 in
X = (8'-1½") + (Elevation 806'-0" - (Elevation 783'-0" + 6 ft above floor)) = 25'-1½"
Y = Height / 2 = 5 ft / 2 = 2.5 ft
Z = Width / 2 = 9'-1 ½" / 2 = 54.75 in
Activity Source: Table 5
Source Material: water with a source density of 0.43 gm/cc
Shield: 3 ft concrete
Buildup: concrete

Dose correction factors for the RADTRAD 60 isotope source term are provided in Section 3.4. The correction factors obtained from EC-RADN-1135 do not address a charcoal filter DBA-LOCA source term. Based on the results given in EC-RADN-1135, since the correction factors increase with shield thickness and source density, using the EC-RADN-1135 correction factors for the AST liquid source and 3 ft of concrete shielding should be conservative for the SGTS charcoal filter source which has an equivalent source density of 0.43 gm/cc. In order to verify this assumption, the SGTS filter model was run using the MICROSHIELD SGTS model and the AST liquid source term activity distribution from EC-RADN-1135, Table 13. Using the EC-RADN-1135 methodology, results for the GROVE, ICRP38 and RADTRAD isotopic libraries at 1 hour post-accident (results in the highest dose correction factors) are as follows:

GROVE Case: 615.0 mr/hr
ICRP 38 Case: 3.062 mr/hr
Therefore, total 183 isotopes = 615.0 mr/hr + 3.062 mr/hr = 618.1 mr/hr
RADTRAD Case: 281.3 mr/hr

Ratio 183 Isotopes / RADTRAD for charcoal = 618.1 mr/hr / 281.3 mr/hr = 2.20
Ratio 183 Isotopes / RADTRAD for AST liquid source = 2.30 (See EC-RADN-1135, Table 15)

It can be seen that the AST liquid source correction factor bounds the SGTS model. Therefore, use of the dose correction factors for the AST liquid source is conservative for use with the SGTS filter.

The MICROSHIELD Version 5.01 computer code outputs for the SGTS filter direct shine dose analysis are given in Attachment 6; including the outputs used for the application of SGTS dose correction factors. These dose rates and the analysis of the 30 day TID dose using the log-log integration methodology given in Section 4.2 of this calculation are summarized in Table 15. The maximum direct shine dose rate to the control room occurs at 16 hours post-accident and is 24.6 mr/hr. The 30 day TID to the H&V Equipment Room Area at CRHE elevation 783'-0" is 0.681 Rem EDE.

The Technical Support Center located on elevation 741'-1" of the CRHE is shielded from the SGTS filter by an additional 3 ft of concrete shielding provided by floor elevations 783'-0", 771'-0" and 754'-0". Based on the results obtained for elevation 783/-0", an additional 3 ft of concrete shielding will reduce the 30 day direct shine dose rate to the TSC from the SGTS filters to a negligible level. This is verified as follows:

An additional 3 ft of concrete radiation shielding provides a dose reduction factor RF of

$$RF = B\, e^{-(\mu\rho)\, x}$$

where:
B = buildup factor for shielding configuration
$\mu\rho$ = total linear attenuation factor (cm^{-1})
x = thickness of concrete shielding provided by control structure (cm)

An average gamma energy of 2.0 Mev is conservatively assumed for this analysis based on the results given in Attachment 6 for the SGTS filter. Therefore, from Section 5 of Reference 6.16 for ordinary concrete:

μ(2.0 Mev) = 0.0448 cm^2/gm where ρ concrete = 2.35 gm/cm^3.
Therefore: $\mu\rho$ = 0.105 cm^{-1}

For 3.0 ft of concrete:

μx = 0.105/cm X 3 ft X 30.48 cm/ft = 9.6

B(μx) at 1.0 Mev = 11.4 (From Section 5 of Reference 6.16 for μx = 10)

RF for 3 ft concrete = $Be^{-\mu x} = 11.4e^{-9.6}$ = 7.72E-04

Therefore, the 30 day DBA-LOCA TID on elevation 741'-1" of the CRHE from the SGTS filters with an additional 3 ft of concrete shielding would be 0.681 Rem EDE x 7.72E-04 = 0.0005 Rem EDE.

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4.9.2 Direct Shine Dose From DBA-LOCA Sources Contained In Systems And Components Inside Or External To The Control Room Envelope

DBA-LOCA contained system sources are identified in calculation EC-076-1003 (Reference 6.14). Based on this evaluation, the contained sources that are dose contributors for shine to the control structure are core spray and residual heat removal system piping located inside the reactor building in Plant Areas 27, 29, 30 and 33. These piping contained sources are identified in marked-up copies of the Reference 6.19 plant design composite piping drawings and are included as Attachment 2 to this calculation. Please note that with respect to contained piping source, SSES Unit 1 and Unit 2 are mirror images; i.e. Unit 1 Plant Areas 27 and 29 and Unit 2, Plant Areas 30 and 33 have the same contained sources with respect to source type and location. Direct shine dose rates inside the control structure are evaluated using Unit 1 contained source geometry. These dose results are applicable to Unit 2.

Using the contained source locations identified in Attachment 2 and selecting dose receiver locations that represent the location for the maximum shine dose rate in the area or for the floor elevation, the direct shine dose analyses for the control structure from contained sources is as follows:

a. **Control Structure Floor Elevation 698'-0"**

Sources

1. Core spray piping 14" GBB-101
   Vertical section of core spray piping extending from elevation 662'-6" to elevation 763'-3 3/8". Located 3 ft east of Column Line P and 2'-3" north of Column Line 26.5. (See EC-RADN-076-1003, page 385 or SSES Drawing GBB-101-2)

2. Core spray piping 10" GBB-103
   Horizontal section of piping located at elevation 697'-9". Pipe runs southeast from 14" GBB-101 into shielded equipment room I-202 and is approximately 43 ft in length. (See EC-RADN-076-1003, page 392 or SSES Drawing GBB-103-2)

3. Other Piping Segments
   All other contained piping sources on elevation 683'-0" of the reactor building are located in equipment room I-202 which provides an additional 2'-6" of concrete radiation shielding for these sources with respect to shine to the control structure. The dose contribution from these piping sources is small compared to the doses resulting from piping located outside this room.

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Receiver - Source Locations

Control structure elevation 698'-0" contains the computer room (Room C-202) and the two lower relay rooms (Rooms C-201 & C-203). The only area on this floor designated as an area requiring continuous occupancy post-accident is the computer room. Based on the locations of the piping sources inside the reactor building, the maximum dose rate inside the computer room occurs at the closest point to the contained piping sources which is the north computer room wall (Receiver Location: 36'-6½" north of Column Line 29 and 1'-6" west of Column Line P). This dose rate is due to shine from core spray pipe 10" GBB-103 only. The dose contribution from 14" GBB-101 to the computer room is negligible due to the slant path shield thickness through the 3 ft thick concrete control structure outer wall. Using dimensions obtained from the Reference 6.10.c, 6.10.i and 6.14 pages 385 and 392, the source-receptor geometry for direct shine into the control structure elevation 698'-0" for the computer room is shown in Figure 2. This model is also applicable to the computer room south wall for Unit 2 contained sources.

The maximum dose rate inside the relay room occurs at the location of the 14" GBB-101 core spray line (Receiver Location: 2'-3" north of Column Line 26.5, 1'-6" west of Column Line P). The dose contribution from the horizontal section of the smaller 10" GBB-101 pipe at this receiver location is not significant due to the shielding effects of the 14" GBB-101 pipe and due to the equivalent slant path shield thickness through the control structure shield wall (10"GBB-103 is routed at an angle of approximately 38° to the 3 ft concrete control structure wall and is located below the 698'-0" floor elevation). Also, the 14" GBB-101 pipe is conservatively modeled as a thirty foot section of pipe with dose rates conservatively evaluated at the center of the pipe. The source-receptor geometry for shine into the control structure from core spray pipe 14" GBB-101 is shown in Figure 3. The shine dose rate from 14" GBB-101 for each relay room is the same due to the same source location in both the Unit 1 and Unit 2 reactor buildings. This model is applicable to both relay rooms for Unit 1 and 2 contained sources and is also applicable to other floor elevations of the control structure where this pipe source is a dose contributor.

Shine Dose Analysis

The MICROSHIELD computer code is used to evaluate dose rates inside the control structure as a function of time post-accident . The core spray piping is modeled as a cylinder-shield at side. Using the data given in Figures 2 and 3, the MICROSHIELD models for core spray piping for shine doses to control structure elevation 698'-0" are as follows:

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MICROSHIELD MODEL - 10" GBB-103, Dose to computer room elevation 698'-0"

Geometry 7 - Cylinder Volume - Side Shields
Height = 516.44 in
Radius = 5.01 in
Wall Clad = 0.365 in steel
X = 288.32 in
Y = Height / 2 = 516.44 in / 2 = 258.22 in ft
Z = 0
Activity Source: Table 7
Source Material: water
Shield: 39.9 in concrete (slant path thickness through control structure wall = 3 ft concrete / sin (64.35°) = 39.9 in)
Buildup: concrete

The MICROSHIELD Version 5.01 computer code outputs for the direct shine dose into the computer room located on elevation 698'-0" from 10"GBB-103 are given in Attachment 7. These dose rates and the analysis of the 30 day TID dose using the log-log integration methodology given in Section 4.2 of this calculation are summarized in Table 16. The maximum direct shine dose rate to the computer room occurs at 2 hours post-accident and is 3.868E+0 mr/hr. The 30 day TID to the computer room is 0.0579 Rem EDE.

MICROSHIELD MODEL - 14" GBB-101, Dose to relay room elevation 698'-0"

Geometry 7 - Cylinder Volume - Side Shields
Height = 360 in
Radius = 6.625 in
Wall Clad = 0.375 in steel
X = 60 in (receiver located 6 inches from control structure wall; Doses also evaluated at 1, 3, 5, 10 and 15 ft from control structure wall)
Y = Height / 2 = 360 in / 2 = 180 in
Z = 0
Activity Source: Table 7
Source Material: water
Shield: 36 in concrete
Buildup: concrete

The MICROSHIELD Version 5.01 computer code outputs for the direct shine dose into the relay room from 14"GBB-101 are given in Attachment 8. These dose rates and the analysis of the 30 day TID dose using the log-log integration methodology given in Section 4.2 of this calculation are summarized in Table 17 through 22. The doses inside the relay rooms at elevation 683'-0" as a function of distance from the control structure wall are summarized as follows:

SUMMARY OF DOSES INSIDE RELAY ROOMS AT ELEVATION 698'-0" FROM 14" GBB-101 CORE SPRAY PIPE		
Distance Inside CRHE From Control Structure Wall (ft)	Maximum Dose Rate @ 2 Hours (mr/hr)	(1) 30 Day TID (Rem) EDE
0.5	97.3	1.40
1	88.6	1.27
3	65.1	0.935
5	51.3	0.738
10	33.3	0.479
15	24.3	0.349
Notes: (1) 30 Day TID is for the case of 100% occupancy as defined in RG 1.183		

b. Control Structure Floor Elevation 714'-0"

Sources

1. Core spray piping 14" GBB-101
   Vertical section of core spray piping extending from elevation 662'-6" to elevation 763'-3 3/8". Located 3 ft east of Column Line P and 2'-3" north of Column Line 26.5. (See EC-RADN-076-1003, page 385 or SSES Drawing GBB-101-2)

2. Residual heat removal system piping 12" GBB-107
   Vertical section of piping extending from elevation 702'-6" to elevation 742'-9". Located 2'-5 3/8" north of Column Line 27.5 and 4'-6" east of Column Line S. (See EC-RADN-076-1003, page 17 or SSES Drawing GBB-107-1)

Receiver - Source Locations

Control structure elevation 714'-0" contains the lower cable spreading rooms. These areas are not designated as areas requiring continuous occupancy post-accident. Based on the locations of the piping sources inside the reactor building, the maximum dose rate inside the cable spreading rooms occurs at the location of the 14" GBB-101 core spray line (Receiver Location: 2'-3" north of Column Line 26.5, 1'-6" west of Column Line P). The dose contribution from 12"GBB-107 at this location is small compared to the 14" GBB-101 core spray line since

12"GBB-107 is located at an additional distance of 100 ft, the majority of the pipe is shielded by the 6 ft thick concrete containment wall and doses are further reduced by the slant path shield effect of the control structure 3 ft thick concrete wall. The shine dose rate from 14" GBB-101 for each cable spreading room is the same due to the same source location in both the Unit 1 and Unit 2 reactor buildings.

Using dimensions obtained from the Reference 6.10.c and 6.14 page 385, the source-receptor geometry for shine into the control structure from core spray pipe 14" GBB-101 is shown in Figure 3 and is applicable to the cable spreading rooms on elevation 714'-0" and other floor elevations of the control structure where this pipe source is a dose contributor.

Shine Dose Analysis

The direct shine source-receptor geometry for contained sources for elevation 714'-0" of the CRHE is the same as for the relay rooms located on CRHE elevation 698'-0" (See Section 4.9.2.a of this calculation). Therefore, the MICROSHIELD Version 5.01 computer code outputs for the direct shine dose for the cable spreading rooms located on elevation 714'-0" from 14"GBB-101 are as given in Attachment 8. These dose rates and the analysis of the 30 TID dose using the log-log integration methodology given in Section 4.2 of this calculation are summarized in Tables 17 through 22. The doses inside the cable spreading rooms at elevation 714'-0" as a function of distance from the control structure wall are summarized as follows:

SUMMARY OF DOSES TO CRHE ELEVATION 714'0" FROM 14" GBB-101 CORE SPRAY PIPE

Distance Inside CRHE From Control Structure Wall (ft)	Maximum Dose Rate @ 2 Hours (mr/hr)	(1) 30 Day TID (Rem) EDE
0.5	97.3	1.40
1	88.6	1.27
3	65.1	0.935
5	51.3	0.738
10	33.3	0.479
15	24.3	0.349

Notes:
(1) 30 Day TID is for the case of 100% occupancy as defined in RG 1.183

c. **Control Structure Floor Elevation 729'-1" And 741'-1**

Sources

1. Core spray piping 14" GBB-101
   Vertical section of core spray piping extending from elevation 662'-6" to elevation 763'-3 3/8". Located 3 ft east of Column Line P and 2'-3" north of Column Line 26.5. (See EC-RADN-076-1003, page 385 or SSES Drawing GBB-101-2)

2. Residual heat removal system piping 12" GBB-107
   Vertical section of piping extending from elevation 702'-6" to elevation 742'-9". Located 2'-5 3/8" north of Column Line 27.5 and 4'-6" east of Column Line S. (See EC-RADN-076-1003, page 17 or SSES Drawing GBB-107-1)

Receiver - Source Locations

Layout of control structure elevations 729'-1" and 741'-1" is given in Reference 6.10.j. Elevation 729'-1" contains the main control room (Room C-409), the STA Office (Room C-401) and the Operational Support Center (Room C-402). Elevation 741'-1" is the Technical Support Center (Room C-410), an electrical equipment room (Room C-414) and the NRC conference room (Room C-413). All areas on elevations 729'-1" and 741'-1" are designated as areas requiring continuous occupancy post-accident. Based on the locations of the piping sources inside the reactor building, the maximum dose rate inside these areas occurs at the closest location to the 14" GBB-101 core spray line (Source Location: 2'-3" north of Column Line 26.5, 1'-6" west of Column Line P). The shine dose rate from this contained source for corresponding locations in the north and south ends of these areas is the same due to the same source locations in both the Unit 1 and Unit 2 reactor buildings.

On elevation 729'-1", the STA Office (Room C-401) and the Operational Support Center (Room C-402) are directly opposite the location of 14" GBB-101. On elevation 741'-1", an electrical equipment room (Room C-413) and the NRC conference room (Room C-414) are also directly opposite the location of 14" GBB-101. For these rooms, the source-receptor geometry for shine into the control structure from the closest location to core spray pipe 14" GBB-101 is shown in Figure 3. This is the same source-receptor location used for the relay room on elevation 698'-0" and the cable spreading room on elevation 714'-0". This model is applicable to other floor elevations of the control structure where this pipe source is a dose contributor. The dose contribution from the 12" GBB-107 RHR line for these rooms is small compared to the 14" GBB-101 core spray line since 12" GBB-101 is located at an additional distance of 100 ft, the majority of the pipe is shielded by the 6 ft thick concrete containment wall and doses are further reduced by the slant path shield effect of the control structure 3 ft thick concrete wall.

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The total direct shine dose to the main control room (Room C-409) and the main TSC (Room C-410) is the sum of the shine doses from 14" GBB-101 and 12" GBB-107. Using dimensions obtained from the Reference 6.10.j and 6.14 page 385, the source-receptor geometry for the main control room (Room C-409) and the main TSC (Room C-410) at the closest distance to 14" GBB-101 is shown in Figure 4. This source-receptor geometry is based on the receiver located at the main control room north wall. The receiver is located 42'-10" north of Column Line 29 and 2'-0" east of Column Line P. This source receptor location is also applicable to the main control room south wall and is conservative for dose rates outside the TSC electrical equipment room and NRC conference room. The dose contribution from 12" GBB-107 at this location is conservatively calculated assuming the minimum distance between the pipe and the control structure wall located at Column Line P and taking no credit for the slant path shield thickness through this wall. Also, the 12" GBB-107 pipe is conservatively modeled as a fifty foot section of pipe with dose rates conservatively evaluated at the center of the pipe. Using dimensions obtained from References 6.14, page 17, 6.10.d and 6.12.a, the following data is obtained:

Distance from 12" GBB-107 pipe centerline to Column Line P = 84'-6"
Distance from Column Line P to receiver at 6 inches from wall = 2'-0"

Shine Dose Analysis

The direct shine source-receptor geometry for contained sources for the STA Office (Room C-401), the Operational Support Center (Room C-402), the electrical equipment room (Room C-413) and the NRC conference room (Room C-414) on elevations 729'-1" and 741'-1" of the CRHE is the same as for the relay rooms located on CRHE elevation 698'-0" (See Section 4.9.2.a of this calculation). Therefore, the MICROSHIELD Version 5.01 computer code outputs for the direct shine dose to these rooms are as given in Attachment 8. These dose rates and the analysis of the 30 day TID dose using the log-log integration methodology given in Section 4.2 of this calculation are summarized in Tables 17 through 22. The doses inside these rooms as a function of distance from the control structure wall are summarized as follows:

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Date 08/31/2005
Designed By T.F. Mackay
Checked By M.M.Waselus

PROJECT
DBA-LOCA Total Control Room Dose

Calc. No. EC-RADN-1129
Sh. No. 32

Summary Of Doses To STA Office (Room C-401), Operational Support Center (Room C-402), Electrical Equipment Room (Room C-413) and the NRC Conference Room (Room C-414) on elevations 729'-1" and 741'-1" of the CRHE From 14" GBB-101 Core Spray Pipe		
Distance Inside CRHE From Control Structure Wall (ft)	Maximum Dose Rate @ 2 Hours (mr/hr)	(1) 30 Day TID (Rem) EDE
0.5	97.3	1.40
1	88.6	1.27
3	65.1	0.935
5	51.3	0.738
10	33.3	0.479
15	24.3	0.349
Notes: (1) 30 Day TID is based on 100% occupancy as defined in RG 1.183		

The MICROSHIELD computer code is used to evaluate dose rates inside the main control room and the TSC as a function of time post-accident . The core spray and RHR piping is modeled as a cylinder-shield at side.

Using the data given in Figure 4, the MICROSHIELD models for core spray pipe 14"GBB-101 for shine doses to the main control room and TSC are as follows:

MICROSHIELD MODEL - 14" GBB-101, Dose to main control room (C-409) and TSC (C-410)

Geometry 7 - Cylinder Volume - Side Shields
Height = 360 in
Radius = 6.625 in
Wall Clad = 0.375 in steel
X = 60 in (receiver located 6 inches from control structure wall; Doses also evaluated at 1, 3, 5, 10 and 15 ft from control structure wall)
Y = Height / 2 = 360 in / 2 = 180 in
Z = 77 in (Distance from source centerline to control room north wall)
Activity Source: Table 7
Source Material: water
Shield: 36 in concrete
Buildup: concrete

Using the data given above, the MICROSHIELD model for RHR pipe 12"GBB-107 for shine doses to the main control room and TSC is as follows:

MICROSHIELD MODEL - 12" GBB-107, Dose to main control room (C-409) and TSC (C-410)

Geometry 7 - Cylinder Volume - Side Shields
Height = 600 in
Radius = 6 in
Wall Clad = 0.375 in steel
X = 84.5 ft + 2 ft = 86.5 ft = 1038 in (receiver located 6 inches from control structure wall)
Y = Height / 2 = 600 in / 2 = 300 in
Z = 0
Activity Source: Table 7
Source Material: water
Shield: 36 in concrete
Buildup: concrete

The MICROSHIELD Version 5.01 computer code outputs for the direct shine dose into the main control room (C-409) and the technical support center (C-410) from 14" GBB-101 and 12" GBB-107 are given in Attachments 9 and 10, respectively. These dose rates and the analysis of the 30 day TID dose using the log-log integration methodology given in Section 4.2 of this calculation are summarized in Tables 23 and 24. The combined dose from 14" GBB-101 and 12" GBB-107 is calculated in Table 25. From Table 25, the maximum direct shine dose rate to the control room / TSC occurs at 2 hours post-accident and is 5.494E+0 mr/hr; the 30 day TID to the control room and TSC is 5.516E-2 Rem EDE.

d. Control Structure Floor Elevation 754'-0"

Sources

1. Core spray piping 14" GBB-101
   Vertical section of core spray piping extending from elevation 662'-6" to elevation 763'-3 3/8". Located 3 ft east of Column Line P and 2'-3" north of Column Line 26.5. (See EC-RADN-076-1003, page 385 or SSES Drawing GBB-101-2)

2. Other Piping Segments
   All other contained piping sources on elevation 754'-0" of the reactor building are shielded from the control structure by the 6 ft thick concrete reactor containment wall. The dose contribution from these piping sources is small compared to the doses resulting from 14" GBB-101.

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Receiver - Source Locations

Control structure elevation 754'-0" contains the upper relay room and upper cable spreading areas. These areas are not designated as areas requiring continuous occupancy post-accident. Based on the locations of the piping sources inside the reactor building, the maximum dose rate for this floor elevation occurs inside the cable spreading rooms at the location of the 14" GBB-101 core spray line (Receiver Location: 2'-3" north of Column Line 26.5, 1'-6" west of Column Line P). The shine dose rate from this contained source for both cable spreading rooms is the same due to the same source locations in both the Unit 1 and Unit 2 reactor buildings.

Using dimensions obtained from the Reference 6.10.e and 6.14 page 385, the source-receptor geometry for the maximum shine dose on control structure floor elevation 754'-0" from core spray pipe 14" GBB-101 is shown in Figure 3. This model is applicable to other floor elevations of the control structure where this pipe source is a dose contributor.

Shine Dose Analysis

The direct shine source-receptor geometry for contained sources for elevation 754'-0" of the CRHE is the same as for the relay rooms located on CRHE elevation 698'-0" (See Section 4.9.2.a of this calculation). Therefore, the MICROSHIELD Version 5.01 computer code outputs for the direct shine dose for the cable spreading rooms located on elevation 754'-0" from 14"GBB-101 are given in Attachment 8. These dose rates and the analysis of the 30 day TID dose using the log-log integration methodology given in Section 4.2 of this calculation are summarized in Table 17 through 22. The maximum doses on elevation 754'-0" as a function of distance from the control structure wall are summarized as follows:

SUMMARY OF DOSES TO CRHE Elevation 754'-0" FROM 14" GBB-101 CORE SPRAY PIPE

Distance Inside CRHE From Control Structure Wall (ft)	Maximum Dose Rate @ 2 Hours (mr/hr)	(1) 30 Day TID (Rem) EDE
0.5	97.3	1.40
1	88.6	1.27
3	65.1	0.935
5	51.3	0.738
10	33.3	0.479
15	24.3	0.349

Notes:
(1) 30 Day TID is for the case of 100% occupancy as defined in RG 1.183

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e. **Control Structure Floor Elevation 783'-0"**

Sources

Per Attachment 2, there are no dose contributing DBA-LOCA contained system sources for elevation 783'-0". An analysis of the direct shine dose contribution from the SGTS filter located on floor elevation 806'-0" is given in Section 4.9.1 of this calculation.

5.0 RESULTS

DBA-LOCA doses to the Control Room Habitability Envelope (CRHE) are as follows:

SUMMARY OF CONTROL ROOM HABITABILITY ENVELOPE DBA-LOCA DOSES

DBA-LOCA Source	DBA-LOCA Dose (2) (Rem) TEDE		
	Control Structure Elevations 729'-1" And 741'-1" (1)	STA Office (Room C-401), Operational Support Center (Room C-402), Electrical Equipment room (Room C-413), NRC Conference Room (Room C-414)	Computer Room (Room C-202) Elevation 698'-0"
Intake Or Infiltration Of Radioactive Material Contained In The Effluent Plume	3.94	3.94	3.94
Radiation Shine From The Radioactive Effluent Plume	0.0495	0.0495	0.0495
Intake Or Infiltration Of Airborne Radioactive Material From Areas And Structures Adjacent To The Control Room Envelope	0	0	0
Shine From Containment	Negligible	Negligible	Negligible
Shine From The Reactor Building	0.0456	0.0456	0.0456
Shine From The Turbine Building	0.0169	0.0169	0.0169
Shine From Radioactive Material In Systems And Components - Piping	0.0552	0.738 (3)	0.058
Shine From Radioactive Material In Systems And Components - SGTS Filter	Negligible	Negligible	Negligible
TOTAL	4.11	4.79	4.11

Notes:
(1) Includes all areas except Rooms C-401, C-402, C-413 and C-414.
(2) Radiation shine doses given in this Table are actually Rem EDE. However, since the shine sources are located outside the CRHE, there is no CEDE dose component for these sources. Therefore, the shine dose is equivalent to Rem TEDE.
(3) Dose is evaluated at a distance of 5 ft from the control structure wall at Column Line P. Access control is required to maintain this dose in the STA Office (Room C-401), the Operational Support Center (Room C-402), the electrical equipment room (Room C-413) and the NRC conference room (Room C-414) on elevations 729'-1" and 741'-1" of the CRHE.

Post-accident doses for areas not continuously occupied in the control structure are also evaluated. These results can be used to evaluate post-accident exposures to these areas on a case-by-case basis for frequent or infrequent occupancy or access, if required post-accident. The doses for these areas take into account the RG 1.183 continuous occupancy factors. Results can then be adjusted for the actual access or occupancy requirements. The doses are provided in Sections 4.2 through 4.9 of this calculation and are summarized in Tables 10 through 24.

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 Control Structure Drawings (Included as Attachment 1 to this calculation:
- a. Susquehanna Steam Electric Station Units 1 & 2, Final Safety Analysis Report, FSAR REV 53, 4/99 Figure 6.4-1A, Control Structure Elevation.
- b. SSES Design Drawing E612733, Sheet 1, Shielding And Radiation Zoning Drawing, Control Structure Bldg. El. 656'-0" to El. 714'-0".
- c. SSES Design Drawing E612734, Shielding And Radiation Zoning Drawing, Control Structure Bldg. El. 729'-1" to El. 783'-0".

6.3 SSES Calculation EC-RADN-1125, "CRHE And Offsite DBA-LOCA Doses - Alternate Source Term", Revision 3.

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 SSES Calculation EC-RADN-1135, "Justification Of AST 60 Isotope RADTRAD Source Term For Direct Shine Dose Calculations", Revision 0.

6.6 SQAP-MICROSHIELD5-001-97079, "Software Quality Assurance Plan (SQAP) for MICROSHIELD Version 5.01", Revision 0, Code Version # 001-97079.

6.7 SSES Calculation EC-033-1011, Turbine Building Free Air Volumes, Revision 0.

6.8 NEDC-31858P-A, BWROG Report For Licensing Leakage Rate Limits And Elimination Of Leakage Control Systems, August 1999.

6.9 SSES Design Drawings:

a. E214105, Sheet 1, Reactor/Primary Containment/Reactor Building Composite Overview, Revision 0. (AE Dwg. C-1932, Sheet 1)
b. E214105, Sheet 2, Reactor/Primary Containment/Reactor Building Composite Overview, Revision 1. (AE Dwg. C-1932, Sheet 2)
c. E214105, Sheet 3, Reactor/Primary Containment/Reactor Building Composite Overview, Revision 0. (AE Dwg. C-1932, Sheet 3)
d. E214105, Sheet 4, Reactor/Primary Containment/Reactor Building Composite Overview, Revision 1. (AE Dwg. C-1932, Sheet 4)
e. E214105, Sheet 5, Reactor/Primary Containment/Reactor Building Composite Overview, Revision 1. (AE Dwg. C-1932, Sheet 5)
f. E214105, Sheet 6, Reactor/Primary Containment/Reactor Building Composite Overview References, Revision 1. (AE Dwg. C-1932, Sheet 6)
g. E214105, Sheet 7, Reactor/Primary Containment/Reactor Building Composite Overview References, Revision 0. (AE Dwg. C-1932, Sheet 7)
h. E214105, Sheet 8, Reactor/Primary Containment/Reactor Building Composite Overview References, Revision 2. (AE Dwg. C-1932, Sheet 8)
i. E214105, Sheet 9, Reactor/Primary Containment/Reactor Building Composite Overview References, Revision 1. (AE Dwg. C-1932, Sheet 9)

6.10 SSES Design Drawings:

a. E105004, Sheet 1, General Floor Plans El 646'-0", El 645'-0" & 656'-0", Revision 24. (AE Dwg. A-11, Sheet 1)
b. E105004, Sheet 2, General Floor Plans El 670'-0" & 676'-0", Revision 34. (AE Dwg. A-12, Sheet 1)
c. E105004, Sheet 3, General Floor Plans El's 683'-0", 699'-0", 714'-0" & 716'-0", Revision 26. (AE Dwg. A-13, Sheet 1)
d. E105004, Sheet 4, General Floor Plans El 719'-0" & 729'-0", Revision 25. (AE Dwg. A-14, Sheet 1)
e. E105004, Sheet 5, General Floor Plans El's 749'-1", 754'-0", 762'-0", 771'-0" & 783'-0", Revision 27. (AE Dwg. A-15, Sheet 1)
f. E105004, Sheet 6, General Floor Plans El's 779'-1", 799'-1" & 806'-1", Revision 22. (AE Dwg. A-16, Sheet 1)
g. E105004, Sheet 7, General Floor Plans El 818'-1" & Roof Plans", Revision 27. (AE Dwg. A-17, Sheet 1)
h. E105005, Sheet 1, General Cross Section "A", South Of Col. Line 29, Looking North, Revision 9. (AE Dwg. A-18, Sheet 1)
i. E105021, Sheet 1, Control Structure Floor Plan @ El. 698'-0", 698'-1" Computer & Relay Room (AE Dwg. No. A-103)

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j. E105023, Sheet 1, Control Structure, Control Rm. & Operational Support Center Fl. Plan @ El. 729'-1", Technical Support Center Fl. Plan @ 741'-1", Revision 36 (AE Drawing No. A-105)

6.11 SSES Design Drawings:

a. E106305, General Arrangement Plan Of Basement, El. 656'-0" & 645'-0", Revision F. (AE Dwg. M-200)
b. E106306, General Arrangement Plan Of Ground Floor Elev. 676'-0" & Elev. 668'-0", Revision F. (AE Dwg. M-201)
c. E106307, General Arrangement Plan Of Mezzanine Floor, Elev. 699'-0" & Elev. 688'-0"Revision F. (AE Dwg. M-202)
d. E106308, General Arrangement Plan Of Operating Floor, El. 729'-0" & 719'-0", Revision 4. (AE Dwg. M-203)
e. E106309, General Arrangement Plan Of El. 762'-0" & 749'-1", Revision 0. (AE Dwg. M-204)
f. E106310, General Arrangement Plan Of El. 791'-0" & El.779'-1", Revision F. (AE Dwg. M-205)
g. E106311, General Arrangement Plan Fueling Floor El. 818'-1", Revision F. (AE Dwg. M-206)
h. E106312, General Arrangement Sections A-A & B-B, Revision F. (AE Dwg. M-207)

6.12 SSES PP&L Civil Drawings

a. E105522, Sheet 1, Central Control Building Floor Plan Elevation 728'-1" Area 12, Revision 14 (AE Dwg. C-709)
b. E105522, Sheet 2, Central Control Building Floor Plan Elevation 728'-1" Area 21, Revision 14 (AE Dwg. C-710)
c. E105523, Sheet 1, Central Control Building Floor Plan Elevation 753-0" Area 12, Revision 12 (AE Dwg. C-711)
d. E105523, Sheet 2, Central Control Building Floor Plan Elevation 753'-0" Area 21, Revision 11 (AE Dwg. C-712)
e. E105524, Sheet 2, Central Control Building Floor Plan Elevation 771'-0" Area 21 (AE Dwg. C-714)
f. E105525, Sheet 2, Central Control Building Floor Plan Elevation 783'-0" Area 21 (AE Dwg. C-716)
g. E105526, Sheet 1, Central Control Building Floor Plan Elevation 806'-0" Area 12, Revision 8 (AE Dwg. C-717)
h. E105526, Sheet 2, Central Control Building Floor Plan Elevation 806'-0" Area 21, Revision 8 (AE Dwg. C-718, Sheet 1)
i. E105527, Sheet 1, Central Control Building Roof Plan El. 825'-0" Area 12, Revision 6 (AE Dwg. C-719)

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j. E105527, Sheet 2, Central Control Building Roof Plan El. 825'-0" Area 21, Revision 8 (AE Dwg. C-720)
k. E-105529, Sheet 8, Central Control Building Units 1 & 2 Wall Elevations Embedded Items El. 753'-0" to El. 783'-0" (AE Dwg C-725, Sheet 2)
l. E-105529, Sheet 9, Central Control Building Units 1 & 2 Wall Elevations & Sections El. 783'-0" to El. 836'-0" (AE Dwg C-726, Sheet 2)
m. E105530, Sheet 1, Central Control Building Units 1 & 2 Elevator Wall Elevations El. 656'-0" to El. 753'-0" (AE Dwg. C-728)
n. E105547, Central Control Building Floor Plans El. 763'-6½" & El. 792'-10" Plans, Sections, & Details (AE Dwg. C-750)
o. E105520, Sheet 1, Central Control Building Floor Plan Elevation 697'-0" Area 12, Revision 16 (AE Dwg. C-705, Sheet 1)
p. E105520, Sheet 2, Central Control Building Floor Plan Elevation 697'-0" Area 21, Revision 13 (AE Dwg. C-706)
q. E105521, Sheet 1, Central Control Building Floor Plan Elevation 714-0" Area 12, Revision 13 (AE Dwg. C-707, Sheet 1)
r. E105521, Sheet 2, Central Control Building Floor Plan Elevation 714'-0" Area 21, Revision 13 (AE Dwg. C-708, Sheet 1)

6.13 SSES Design Civil Drawings:

a. E105227, Reactor Building Unit 1 Floor Plan Elevation 719'-1", Area 27 (AE Dwg. No. C-178)
b. E105229, Reactor Building Unit 1 Floor Plan Elevation 719'-1", Area 29 (AE Dwg. No. C-180)
c. E105238, Reactor Building Unit 1 Floor Plan Elevation 749'-1", Area 27 (AE Dwg. No. C-200)

6.14 SSES Calculation EC-076-1003, "Post-LOCA Containment Radiation Sources HPCI, RCIC, RHR, Core Spray, Main Steam Drains, Process Radiation Monitoring", Revision 3.

6.15 SSES Drawing FF 108710, Sheet 2601, Revision 9, HECA Filter Unit-Final Assembly - 10,500 cfm

6.16 J. C. Courtney, Editor, A Handbook of Radiation Shielding Data, Louisiana State University, August 1975.

6.17 SSES Design Drawing E106304, Piping Specifications (AE Dwg. No. M-199).

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6.18 Flow Of Fluids Through Valves, Fittings And Pipe, Appendix B, CRANE Co., Nineteenth Printing, 1980.

6.19 SSES Design Drawings:

a. E106177, Sheet 1, Plant Design Drawing Reactor Building Unit 1, Area 27 Plan Of Elevation 645'-0", Revision 22 (AE Dwg. No. M-27-1, Sheet 1)
b. E106177, Sheet 2, Plant Design Drawing Reactor Building Unit 1, Area 27 Plan Of Elevation 670'-0", Revision 19 (AE Dwg. No. M-27-2, Sheet 1)
c. E106177, Sheet 3, Plant Design Drawing Reactor Building Unit 1, Area 27 Plan Of Elevation 683'-0", Revision 33 (AE Dwg. No. M-27-3, Sheet 1)
d. E106177, Sheet 4, Plant Design Drawing Reactor Building Unit 1, Area 27 Plan Of Elevation 719'-0", Revision 30 (AE Dwg. No. M-27-4, Sheet 1)
e. E106177, Sheet 5, Plant Design Drawing Reactor Building Unit 1, Area 27 Plan Of Elevation 749'-0", Revision 22 (AE Dwg. No. M-27-1, Sheet 1)
f. E106177, Sheet 10, Plant Design Drawing Reactor Building Unit 1, Area 27 Section D-D", Revision 35 (AE Dwg. No. M-27-10, Sheet 1)
g. E106177, Sheet 11, Plant Design Drawing Reactor Building Unit 1, Area 27 Section E-E", Revision 22 (AE Dwg. No. M-27-11, Sheet 1)
h. E106179 , Sheet 1, Plant Design Drawing Reactor Building Unit 1, Area 29 Plan Of Elevation 645'-0", Revision 30 (AE Dwg. No. M-29-1, Sheet 1)
i. E106179, Sheet 2, Plant Design Drawing Reactor Building Unit 1, Area 29 Plan Of Elevation 670'-0", Revision 25 (AE Dwg. No. M-29-2, Sheet 1)
j. E106179, Sheet 3, Plant Design Drawing Reactor Building Unit 1, Area 29 Plan Of Elevation 683'-0", Revision 33 (AE Dwg. No. M-29-3, Sheet 1)
k. E106179, Sheet 4, Plant Design Drawing Reactor Building Unit 1, Area 29 Plan Of Elevation 719'-0", Revision 30 (AE Dwg. No. M-29-4, Sheet 1)
l. E106179, Sheet 5, Plant Design Drawing Reactor Building Unit 1, Area 29 Plan Of Elevation 749'-0", Revision 26 (AE Dwg. No. M-29-1, Sheet 1)
m. E106179, Sheet 12, Plant Design Drawing Reactor Building Unit 1, Area 29 Section E-E", Revision 46 (AE Dwg. No. M-29-12, Sheet 1)

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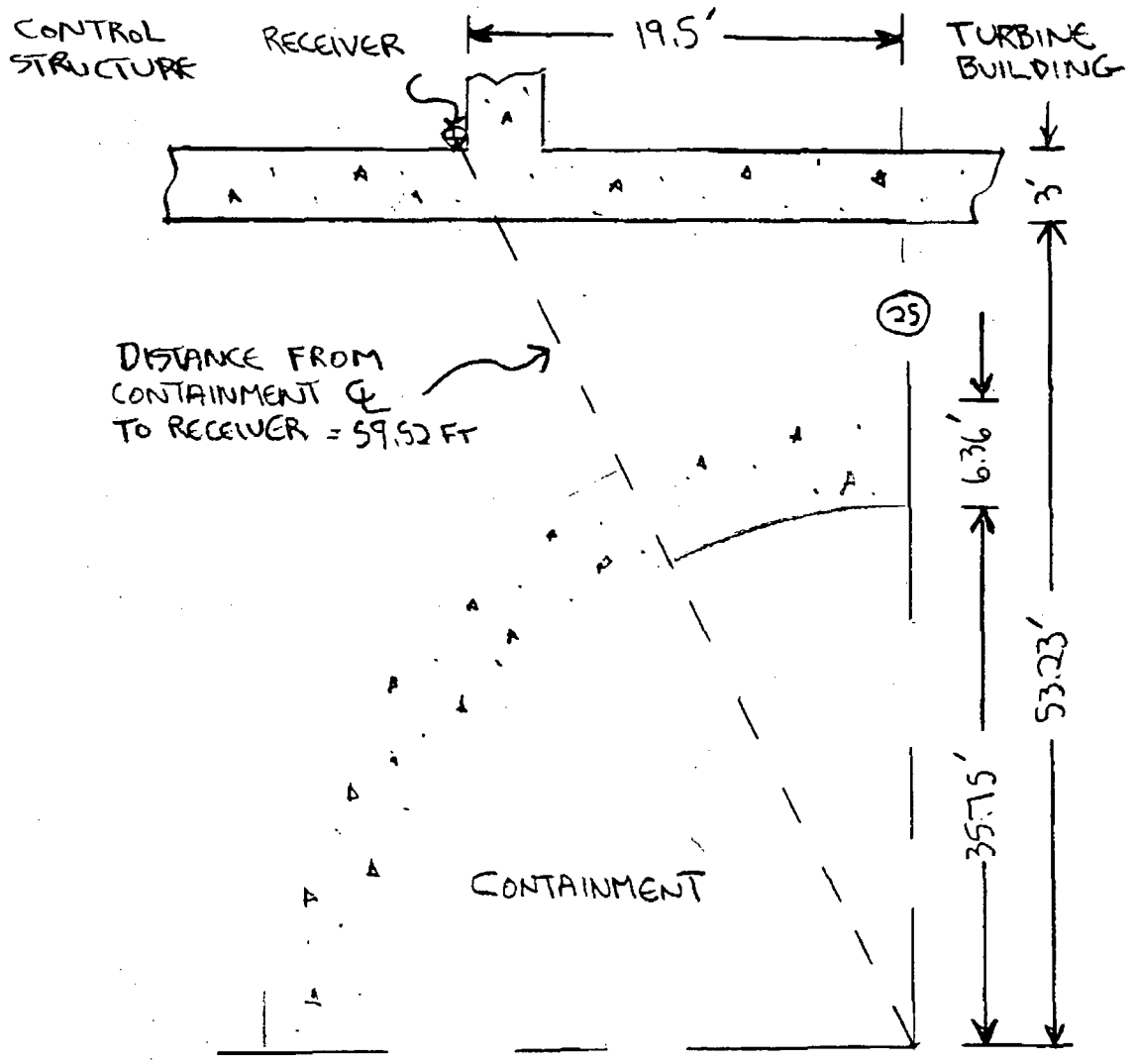

FIGURE 1. SOURCE - RECEPTOR GEOMETRY FOR CONTAINMENT SHINE DOSE TO CONTROL STRUCTURE; ALL CONTAINMENT DIMENSIONS OBTAINED AT ELEVATION 729'.

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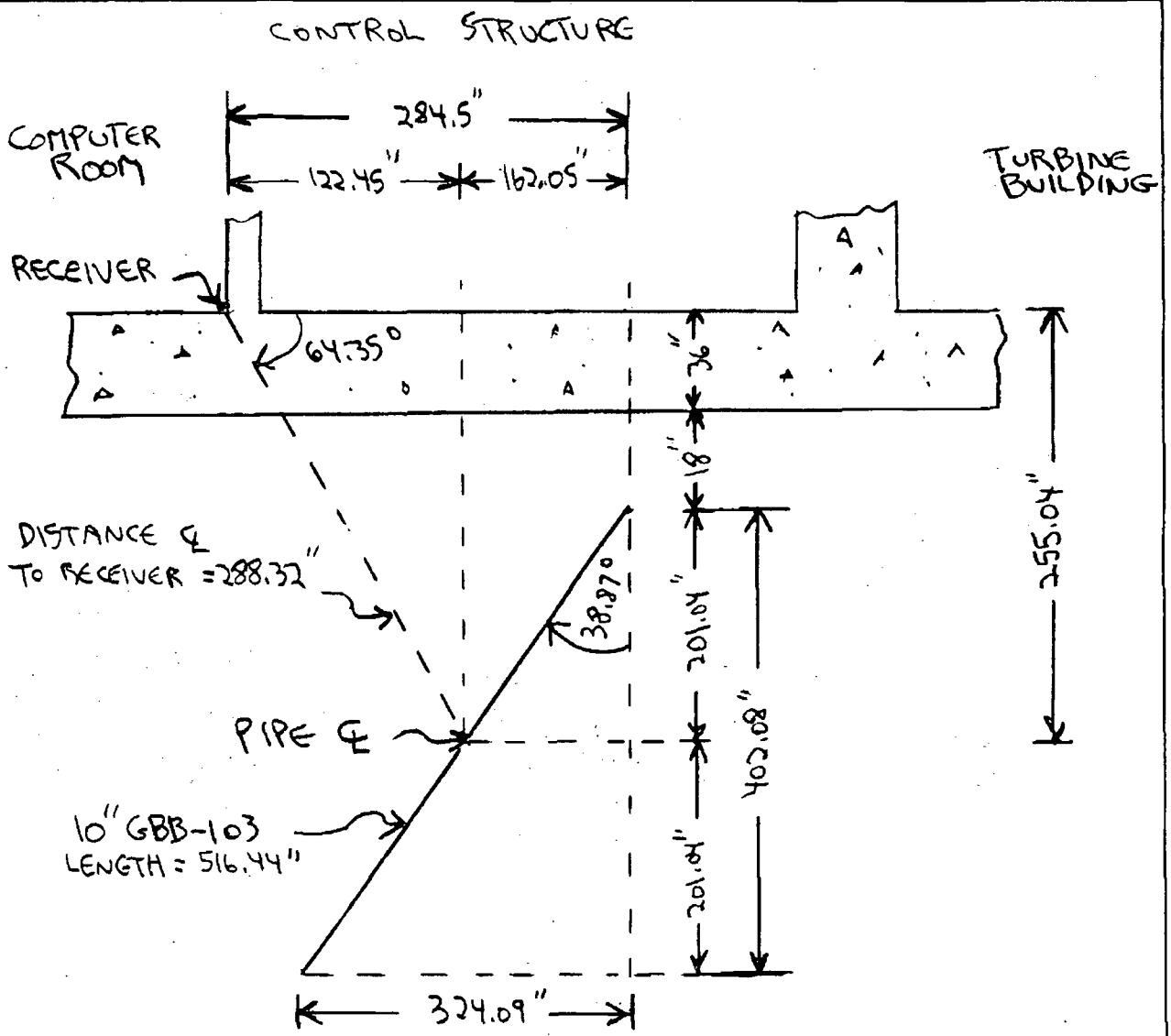

FIGURE 2 SOURCE RECEPTOR GEOMETRY FOR SHINE INTO CONTROL STRUCTURE - COMPUTER ROOM ELEVATION 698'-0"

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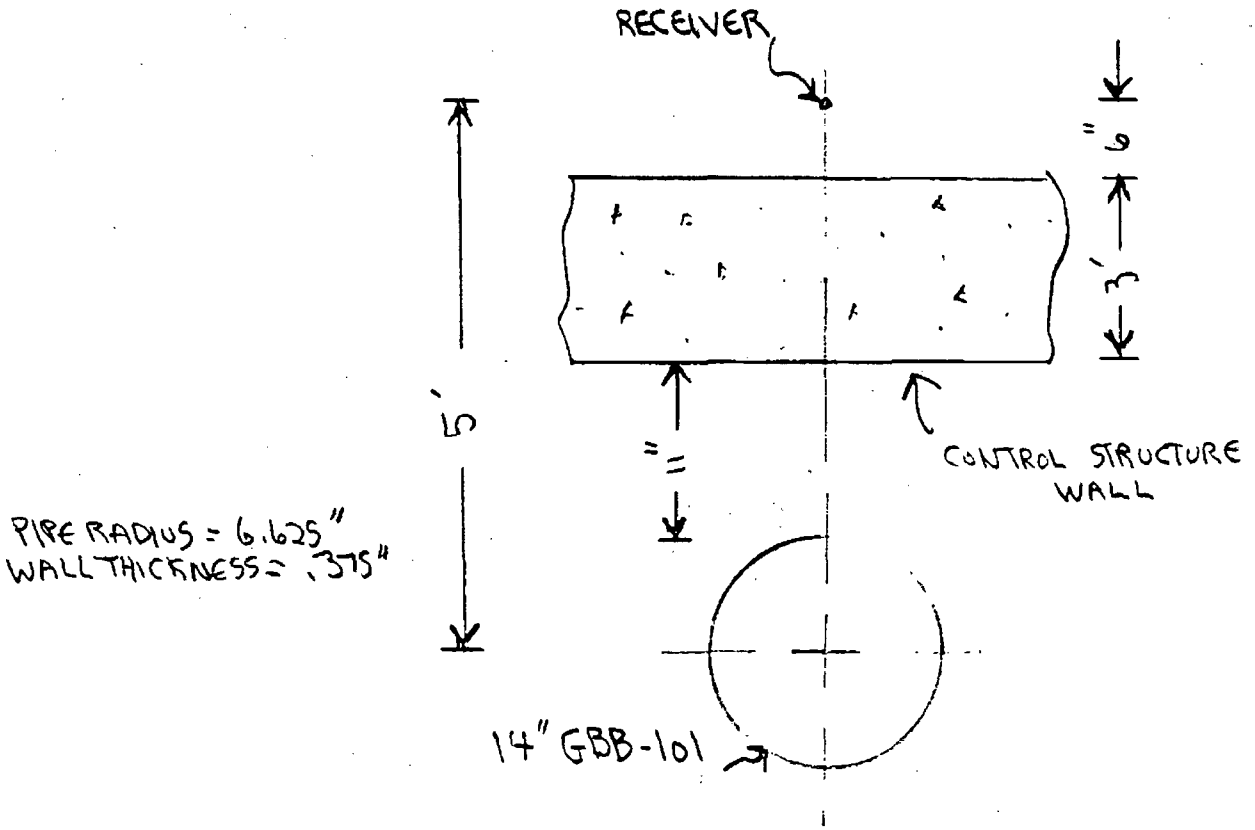

FIGURE 3. SOURCE-RECEPTOR GEOMETRY FOR SHINE INTO CONTROL STRUCTURE FROM CORE SPRAY LINE 14" GBB-101

For Information Only

Dept. _____ | **PPL** | ER No. _____
Date _____ 20 _____ | **CALCULATION SHEET** | _____
Designed by _____ | PROJECT _____ | Sht. No. _____ of _____
Approved by _____

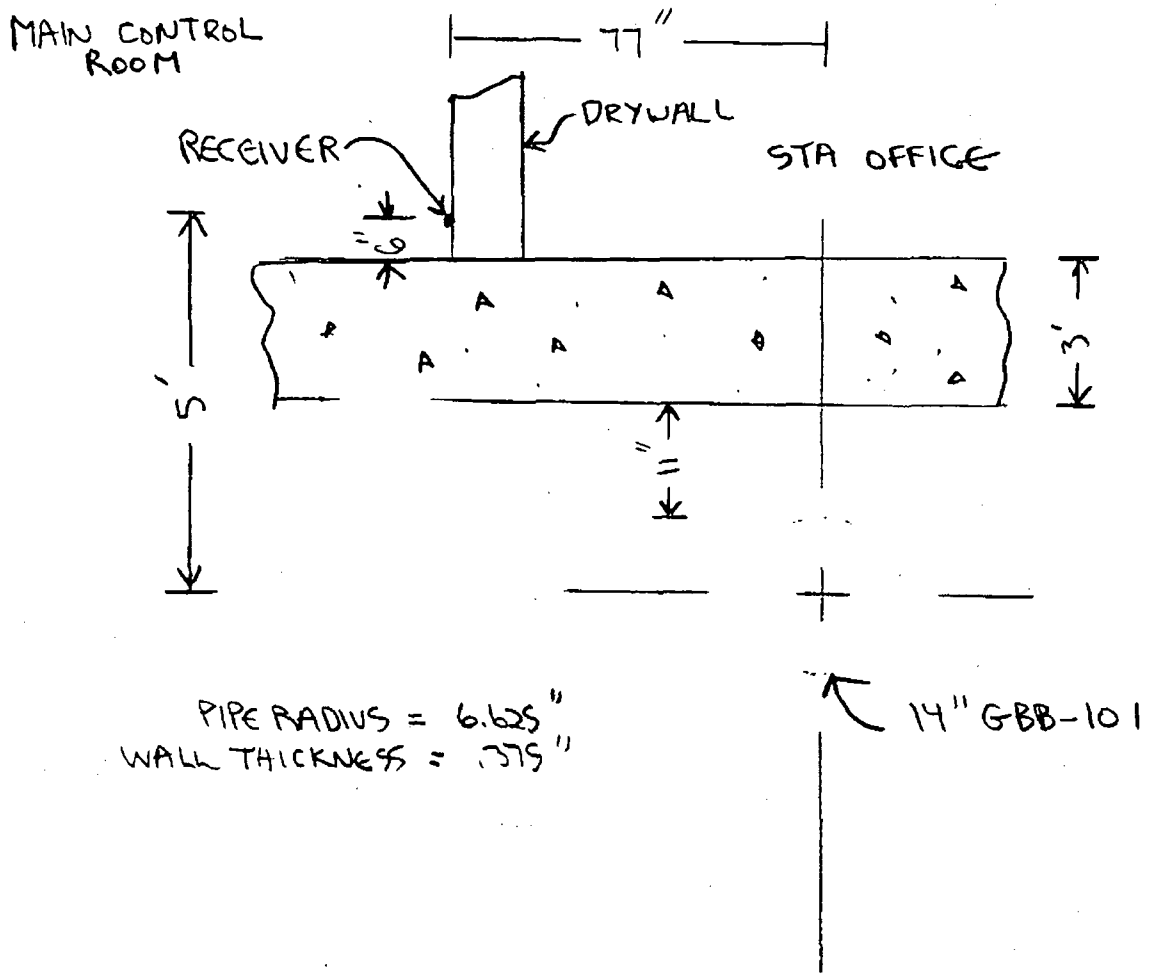

FIGURE 4. SOURCE-RECEPTOR GEOMETRY FOR SHINE INTO MAIN CONTROL ROOM AND TSC FROM CORE SPRAY LINE 14" GBB-101

For Information Only

TABLE 1. DBA-LOCA PRIMARY CONTAINMENT AIRBORNE ACTIVITY

DBA-LOCA PRIMARY CONTAINMENT AIRBORNE ACTIVITY (CURIES)													
Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Am-241			1.526E+00	3.948E+00	4.669E-01	2.325E-02	2.866E-04	4.483E-06	4.081E-07	3.380E-09	1.917E-15		
Ba-139			7.090E+05	1.109E+06	4.794E+04	3.188E+02	7.015E-02	1.959E-05					
Ba-140			1.175E+06	3.030E+06	3.566E+05	1.757E+04	2.121E+02	3.249E+00	2.778E-01	2.031E-03	7.930E-10		
Ce-141			2.700E+04	6.980E+04	8.239E+03	4.083E+02	4.986E+00	7.725E-02	6.827E-03	5.331E-05	2.539E-11		
Ce-143			2.455E+04	6.216E+04	7.045E+03	3.220E+02	3.346E+00	4.414E-02	2.407E-03	7.157E-06			
Ce-144			2.271E+04	5.871E+04	6.938E+03	3.448E+02	4.235E+00	6.602E-02	5.946E-03	4.822E-05	2.572E-11		
Cm-242			3.996E+02	1.033E+03	1.221E+02	6.064E+00	7.445E-02	1.160E-03	1.043E-04	8.425E-07	4.445E-13		
Cm-244			2.342E+01	6.057E+01	7.159E+00	3.559E-01	4.375E-03	6.826E-05	6.162E-06	5.020E-08	2.716E-14		
Co-58			4.449E+02	1.150E+03	1.358E+02	6.741E+00	8.260E-02	1.285E-03	1.148E-04	9.177E-07	4.684E-13		
Co-60			2.395E+02	6.193E+02	7.320E+01	3.639E+00	4.473E-02	6.978E-04	6.297E-05	5.128E-07	2.770E-13		
Cs-134	3.598E+05	9.560E+05	2.143E+06	4.107E+06	4.854E+05	2.413E+04	2.965E+02	4.625E+00	4.171E-01	3.393E-03	1.827E-09		
Cs-136	1.149E+05	3.049E+05	6.826E+05	1.306E+06	1.537E+05	7.572E+03	9.146E+01	1.402E+00	1.200E-01	8.800E-04	3.468E-10		
Cs-137	2.708E+05	7.195E+05	1.613E+06	3.091E+06	3.654E+05	1.816E+04	2.233E+02	3.484E+00	3.145E-01	2.563E-03	1.387E-09		
I-131	1.677E+06	4.482E+06	1.166E+07	2.353E+07	4.154E+06	1.680E+06	1.506E+06	1.458E+06	1.331E+06	1.109E+06	6.420E+05	2.58E+05	1.04E+05
I-132	2.373E+06	6.059E+06	1.525E+07	2.830E+07	3.154E+06	4.543E+05	4.032E+04	3.635E+03	3.294E+00	3.663E-03	5.530E-10		
I-133	3.470E+06	9.180E+06	2.353E+07	4.607E+07	7.662E+06	2.751E+06	1.945E+06	1.483E+06	6.633E+05	1.327E+05	1.062E+03	3.40E-01	1.09E-04
I-134	3.375E+06	6.937E+06	1.218E+07	1.118E+07	4.087E+05	7.096E+03	1.172E+01	2.090E-02	1.194E-10				
I-135	3.255E+06	8.407E+06	2.079E+07	3.790E+07	5.463E+06	1.473E+06	5.876E+05	2.529E+05	2.031E+04	1.311E+02	3.522E-05		
Kr-85	2.467E+04	7.398E+04	5.425E+05	1.479E+06	1.478E+06	1.476E+06	1.471E+06	1.466E+06	1.459E+06	1.444E+06	1.401E+06	1.33E+06	1.27E+06
Kr-85m	4.356E+05	1.241E+06	8.421E+06	1.967E+07	1.442E+07	7.755E+06	2.242E+06	6.481E+05	1.574E+04	9.275E+00	1.899E-09		
Kr-87	8.163E+05	2.041E+06	1.140E+07	1.802E+07	6.053E+06	6.830E+05	8.694E+03	1.107E+02	2.294E-04				
Kr-88	1.194E+06	3.301E+06	2.143E+07	4.577E+07	2.807E+07	1.056E+07	1.493E+06	2.112E+05	6.008E+02	4.860E-03			
La-140			1.835E+04	6.989E+04	2.008E+04	2.107E+03	5.020E+01	1.108E+00	1.634E-01	1.791E-03	8.954E-10		
La-141			8.954E+03	1.941E+04	1.612E+03	3.959E+01	1.187E-01	4.517E-04	5.917E-07				
La-142			6.674E+03	1.101E+04	5.295E+02	4.358E+00	1.469E-03	6.280E-07					
Mo-99			1.501E+05	3.841E+05	4.446E+04	2.119E+03	2.395E+01	3.436E-01	2.411E-02	1.187E-04	1.416E-11		
Nb-95			1.153E+04	2.982E+04	3.524E+03	1.752E+02	2.153E+00	3.359E-02	3.031E-03	2.466E-05	1.323E-11		
Nd-147			4.348E+03	1.122E+04	1.319E+03	6.487E+01	7.809E-01	1.193E-02	1.011E-03	7.263E-06	2.692E-12		
Np-239			3.146E+05	8.037E+05	9.269E+04	4.388E+03	4.890E+01	6.916E-01	4.652E-02	2.104E-04	1.948E-11		
Pr-143			9.674E+03	2.505E+04	2.979E+03	1.497E+02	1.871E+00	2.951E-02	2.687E-03	2.096E-05	8.650E-12		
Pu-238			6.843E+01	1.770E+02	2.092E+01	1.040E+00	1.278E-02	1.995E-04	1.801E-05	1.468E-07	7.950E-14		
Pu-239			7.267E+00	1.880E+01	2.222E+00	1.105E-01	1.360E-03	2.124E-05	1.922E-06	1.571E-08	8.528E-15		
Pu-240			1.169E+01	3.022E+01	3.572E+00	1.776E-01	2.183E-03	3.406E-05	3.075E-06	2.506E-08	1.357E-14		
Pu-241			2.882E+03	7.454E+03	8.810E+02	4.380E+01	5.384E-01	8.400E-03	7.582E-04	6.177E-06	3.341E-12		
Rb-86	3.396E+03	9.016E+03	2.019E+04	3.865E+04	4.554E+03	2.250E+02	2.732E+00	4.210E-02	3.662E-03	2.771E-05	1.200E-11		
Rh-105			8.325E+04	2.147E+05	2.506E+04	1.192E+03	1.292E+01	1.741E-01	9.868E-03	3.139E-05			
Ru-103			1.292E+05	3.338E+05	3.940E+04	1.953E+03	2.387E+01	3.702E-01	3.284E-02	2.583E-04	1.258E-10		
Ru-105			7.641E+04	1.690E+05	1.462E+04	3.893E+02	1.373E+00	6.142E-03	1.308E-05	5.936E-11			
Ru-106			5.147E+04	1.331E+05	1.573E+04	7.816E+02	9.603E+00	1.497E-01	1.349E-02	1.095E-04	5.863E-11		
Sb-127			1.400E+05	3.594E+05	4.185E+04	2.019E+03	2.338E+01	3.435E-01	2.590E-02	1.472E-04	2.706E-11		
Sb-129			4.441E+05	9.782E+05	8.388E+04	2.195E+03	7.475E+00	3.231E-02	6.202E-05	2.285E-10			
Sr-89			6.173E+05	1.595E+06	1.884E+05	9.343E+03	1.143E+02	1.776E+00	1.581E-01	1.254E-03	6.249E-10		
Sr-90			7.872E+04	2.036E+05	2.406E+04	1.196E+03	1.471E+01	2.294E-01	2.071E-02	1.688E-04	9.131E-11		

TABLE 1. DBA-LOCA PRIMARY CONTAINMENT AIRBORNE ACTIVITY

DBA-LOCA PRIMARY CONTAINMENT AIRBORNE ACTIVITY (CURIES)													
Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Sr-91			7.318E+05	1.759E+06	1.797E+05	6.673E+03	4.576E+01	3.983E-01	6.241E-03	1.532E-06			
Sr-92			6.470E+05	1.296E+06	9.182E+04	1.641E+03	2.607E+00	5.256E-03	1.024E-06				
Tc-99m			1.343E+05	3.468E+05	4.073E+04	1.983E+03	2.328E+01	3.443E-01	2.467E-02	1.217E-04	1.452E-11		
Te-127			1.398E+05	3.613E+05	4.259E+04	2.098E+03	2.523E+01	3.835E-01	3.070E-02	1.911E-04	5.296E-11		
Te-127m			2.386E+04	6.170E+04	7.293E+03	3.626E+02	4.457E+00	6.953E-02	6.269E-03	5.085E-05	2.682E-11		
Te-129			4.722E+05	1.125E+06	1.075E+05	3.378E+03	2.536E+01	2.935E-01	2.204E-02	1.716E-04	8.209E-11		
Te-129m			9.992E+04	2.584E+05	3.052E+04	1.515E+03	1.852E+01	2.870E-01	2.538E-02	1.985E-04	9.493E-11		
Te-131m			3.154E+05	7.969E+05	8.994E+04	4.077E+03	4.166E+01	5.403E-01	2.801E-02	7.531E-05			
Te-132			2.293E+06	5.877E+06	6.824E+05	3.274E+04	3.750E+02	5.450E+00	3.977E-01	2.118E-03	3.199E-10		
Xe-133	3.535E+06	1.060E+07	7.766E+07	2.113E+08	2.090E+08	2.042E+08	1.949E+08	1.859E+08	1.622E+08	1.234E+08	5.424E+07	1.38E+07	3.50E+06
Xe-135	1.191E+06	3.681E+06	2.743E+07	7.609E+07	6.706E+07	4.989E+07	2.737E+07	1.498E+07	2.438E+06	6.302E+04	1.047E+00	1.12E-08	
Y-90			1.061E+03	3.698E+03	9.435E+02	9.566E+01	2.302E+00	5.208E-02	8.392E-03	1.095E-04	8.497E-11		
Y-91			8.083E+03	2.106E+04	2.567E+03	1.338E+02	1.741E+00	2.795E-02	2.577E-03	2.065E-05	1.041E-11		
Y-92			4.550E+04	2.112E+05	5.545E+04	2.726E+03	1.246E+01	5.227E-02	5.484E-05	3.938E-11			
Y-93			5.993E+03	1.447E+04	1.491E+03	5.633E+01	3.999E-01	3.603E-03	6.266E-05	1.894E-08			
Zr-95			1.152E+04	2.979E+04	3.518E+03	1.746E+02	2.138E+00	3.324E-02	2.969E-03	2.367E-05	1.201E-11		
Zr-97			1.095E+04	2.718E+04	2.959E+03	1.249E+02	1.106E+00	1.243E-02	4.192E-04	4.770E-07			
SUM	**2.210E+07**	**5.799E+07**	**2.438E+08**	**5.497E+08**	**3.503E+08**	**2.811E+08**	**2.315E+08**	**2.064E+08**	**1.682E+08**	**1.262E+08**	**5.629E+07**	**1.537E+07**	**4.869E+06**

For Information Only

TABLE 2. DBA-LOCA SUPPRESSION POOL ACTIVITY

DBA-LOCA SUPPRESSION POOL ACTIVITY (CURIES)

Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Am-241			1.693E+00	5.078E+00	5.069E+00	5.052E+00	5.016E+00	4.982E+00	4.878E+00	4.677E+00	4.115E+00	3.308E+00	2.647E+00
Ba-139			7.866E+05	1.426E+06	5.204E+05	6.928E+04	1.228E+03	2.177E+01	1.212E-04				
Ba-140			1.303E+06	3.898E+06	3.871E+06	3.817E+06	3.712E+06	3.610E+06	3.321E+06	2.810E+06	1.702E+06	7.377E+05	3.198E+05
Ce-141			2.996E+04	8.978E+04	8.944E+04	8.873E+04	8.728E+04	8.583E+04	8.161E+04	7.377E+04	5.449E+04	3.288E+04	1.985E+04
Ce-143			2.723E+04	7.996E+04	7.648E+04	6.998E+04	5.858E+04	4.904E+04	2.877E+04	9.903E+03	4.038E+02	1.951E+00	9.422E-03
Ce-144			2.519E+04	7.552E+04	7.532E+04	7.492E+04	7.414E+04	7.336E+04	7.108E+04	6.672E+04	5.520E+04	4.024E+04	2.933E+04
Cm-242			4.433E+02	1.329E+03	1.325E+03	1.318E+03	1.303E+03	1.289E+03	1.246E+03	1.166E+03	9.539E+02	6.829E+02	4.888E+02
Cm-244			2.599E+01	7.791E+01	7.772E+01	7.734E+01	7.659E+01	7.584E+01	7.366E+01	6.947E+01	5.828E+01	4.349E+01	3.245E+01
Co-58			4.936E+02	1.479E+03	1.474E+03	1.465E+03	1.446E+03	1.427E+03	1.373E+03	1.270E+03	1.005E+03	6.808E+02	4.611E+02
Co-60			2.657E+02	7.966E+02	7.946E+02	7.907E+02	7.830E+02	7.753E+02	7.527E+02	7.096E+02	5.944E+02	4.424E+02	3.293E+02
Cs-134	3.831E+05	1.149E+06	2.680E+06	5.739E+06	5.724E+06	5.696E+06	5.639E+06	5.582E+06	5.417E+06	5.101E+06	4.258E+06	3.152E+06	2.333E+06
Cs-136	1.223E+05	3.664E+05	8.538E+05	1.824E+06	1.812E+06	1.787E+06	1.739E+06	1.692E+06	1.559E+06	1.323E+06	8.084E+05	3.557E+05	1.566E+05
Cs-137	2.883E+05	8.646E+05	2.017E+06	4.319E+06	4.309E+06	4.288E+06	4.246E+06	4.205E+06	4.084E+06	3.852E+06	3.232E+06	2.413E+06	1.801E+06
I-131	1.780E+06	5.332E+06	1.419E+07	3.181E+07	3.151E+07	3.092E+07	2.977E+07	2.866E+07	2.557E+07	2.032E+07	1.018E+07	3.210E+06	1.013E+06
I-132	2.517E+06	7.176E+06	1.832E+07	3.711E+07	2.369E+07	1.219E+07	7.869E+06	7.231E+06	5.675E+06	3.498E+06	8.194E+05	7.294E+04	6.492E+03
I-133	3.683E+06	1.092E+07	2.864E+07	6.228E+07	5.813E+07	5.063E+07	3.840E+07	2.913E+07	1.272E+07	2.423E+06	1.676E+04	4.209E+00	1.057E-03
I-134	3.582E+06	8.252E+06	1.482E+07	1.511E+07	3.101E+06	1.306E+05	2.315E+02	4.105E-01	2.288E-09				
I-135	3.454E+06	1.000E+07	2.530E+07	5.124E+07	4.144E+07	2.711E+07	1.160E+07	4.967E+06	3.894E+05	2.394E+03	5.560E-04		
La-140			2.055E+04	9.440E+04	2.224E+05	4.619E+05	8.823E+05	1.234E+06	1.956E+06	2.478E+06	1.921E+06	8.563E+05	3.715E+05
La-141			9.934E+03	2.497E+04	1.750E+04	8.603E+03	2.078E+03	5.019E+02	7.073E+00	1.405E-03			
La-142			7.400E+03	1.416E+04	5.748E+03	9.470E+02	2.571E+01	6.978E-01	1.396E-05				
Mo-99			1.665E+05	4.941E+05	4.826E+05	4.605E+05	4.193E+05	3.818E+05	2.882E+05	1.642E+05	3.038E+04	1.825E+03	1.096E+02
Nb-95			1.279E+04	3.835E+04	3.826E+04	3.807E+04	3.770E+04	3.733E+04	3.624E+04	3.413E+04	2.839E+04	2.064E+04	1.482E+04
Nd-147			4.824E+03	1.443E+04	1.432E+04	1.410E+04	1.367E+04	1.326E+04	1.209E+04	1.005E+04	5.776E+03	2.295E+03	9.119E+02
Np-239			3.491E+05	1.034E+06	1.006E+06	9.535E+05	8.560E+05	7.685E+05	5.561E+05	2.912E+05	4.180E+04	1.645E+03	6.476E+01
Pr-143			1.073E+04	3.223E+04	3.235E+04	3.254E+04	3.276E+04	3.279E+04	3.213E+04	2.901E+04	1.857E+04	8.338E+03	3.736E+03
Pu-238			7.591E+01	2.276E+02	2.271E+02	2.260E+02	2.238E+02	2.216E+02	2.153E+02	2.031E+02	1.706E+02	1.276E+02	9.537E+01
Pu-239			8.063E+00	2.418E+01	2.413E+01	2.402E+01	2.381E+01	2.360E+01	2.298E+01	2.174E+01	1.830E+01	1.368E+01	1.022E+01
Pu-240			1.297E+01	3.887E+01	3.878E+01	3.859E+01	3.822E+01	3.785E+01	3.676E+01	3.468E+01	2.911E+01	2.174E+01	1.624E+01
Pu-241			3.198E+03	9.587E+03	9.564E+03	9.517E+03	9.425E+03	9.333E+03	9.064E+03	8.548E+03	7.170E+03	5.349E+03	3.990E+03
Rb-86	3.615E+03	1.083E+04	2.525E+04	5.400E+04	5.370E+04	5.311E+04	5.195E+04	5.082E+04	4.756E+04	4.165E+04	2.798E+04	1.441E+04	7.426E+03
Rh-105			9.236E+04	2.761E+05	2.720E+05	2.591E+05	2.262E+05	1.935E+05	1.180E+05	4.344E+04	2.167E+03	1.466E+01	9.913E-02
Ru-103			1.433E+05	4.294E+05	4.277E+05	4.244E+05	4.178E+05	4.114E+05	3.925E+05	3.575E+05	2.699E+05	1.690E+05	1.058E+05
Ru-105			8.477E+04	2.174E+05	1.587E+05	8.459E+04	2.403E+04	6.825E+03	1.564E+02	8.213E-02	1.190E-11		
Ru-106			5.710E+04	1.712E+05	1.707E+05	1.699E+05	1.681E+05	1.664E+05	1.613E+05	1.516E+05	1.258E+05	9.222E+04	6.761E+04
Sb-127			1.554E+05	4.623E+05	4.543E+05	4.388E+05	4.092E+05	3.816E+05	3.096E+05	2.037E+05	5.807E+04	7.167E+03	8.846E+02
Sb-129			4.927E+05	1.258E+06	9.106E+05	4.769E+05	1.309E+05	3.590E+04	7.414E+02	3.162E-01	2.452E-11		
Sr-89			6.848E+05	2.052E+06	2.045E+06	2.030E+06	2.001E+06	1.973E+06	1.890E+06	1.735E+06	1.341E+06	8.733E+05	5.687E+05
Sr-90			8.733E+04	2.618E+05	2.612E+05	2.599E+05	2.574E+05	2.549E+05	2.476E+05	2.335E+05	1.959E+05	1.463E+05	1.092E+05
Sr-91			8.119E+05	2.263E+06	1.951E+06	1.450E+06	8.010E+05	4.425E+05	7.460E+04	2.121E+03	4.869E-02	9.032E-10	
Sr-92			7.179E+05	1.667E+06	9.968E+05	3.566E+05	4.563E+04	5.840E+03	1.224E+01	5.377E-05			

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TABLE 2. DBA-LOCA SUPPRESSION POOL ACTIVITY

DBA-LOCA SUPPRESSION POOL ACTIVITY (CURIES)

Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Tc-99m			1.490E+05	4.460E+05	4.422E+05	4.310E+05	4.075E+05	3.826E+05	2.949E+05	1.684E+05	3.115E+04	1.871E+03	1.124E+02
Te-127			1.551E+05	4.647E+05	4.624E+05	4.559E+05	4.416E+05	4.261E+05	3.671E+05	2.644E+05	1.137E+05	4.817E+04	2.988E+04
Te-127m			2.647E+04	7.936E+04	7.917E+04	7.879E+04	7.802E+04	7.725E+04	7.494E+04	7.036E+04	5.755E+04	4.056E+04	2.846E+04
Te-129			5.239E+05	1.447E+06	1.167E+06	7.340E+05	4.439E+05	3.262E+05	2.634E+05	2.375E+05	1.762E+05	1.071E+05	6.506E+04
Te-129m			1.109E+05	3.323E+05	3.314E+05	3.291E+05	3.241E+05	3.189E+05	3.034E+05	2.747E+05	2.037E+05	1.238E+05	7.524E+04
Te-131m			3.499E+05	1.025E+06	9.764E+05	8.859E+05	7.293E+05	6.003E+05	3.349E+05	1.042E+05	3.140E+03	9.163E+00	2.674E-02
Te-132			2.544E+06	7.559E+06	7.408E+06	7.115E+06	6.564E+06	6.056E+06	4.755E+06	2.931E+06	6.865E+05	6.111E+04	5.439E+03
Xe-133	2.489E+03	1.732E+04	7.498E+04	3.271E+05	9.614E+05	2.080E+06	3.811E+06	5.010E+06	6.588E+06	6.078E+06	2.483E+06	4.953E+05	9.869E+04
Xe-135	2.841E+04	1.932E+05	8.070E+05	3.278E+06	8.358E+06	1.361E+07	1.420E+07	1.065E+07	2.563E+06	7.883E+04	1.206E+00	1.017E-08	
Y-90			1.186E+03	4.947E+03	1.043E+04	2.097E+04	4.046E+04	5.801E+04	1.004E+05	1.515E+05	1.824E+05	1.463E+05	1.098E+05
Y-91			8.969E+03	2.712E+04	2.790E+04	2.910E+04	3.051E+04	3.109E+04	3.084E+04	2.860E+04	2.237E+04	1.484E+04	9.847E+03
Y-92			5.175E+04	2.951E+05	6.178E+05	5.997E+05	2.196E+05	5.838E+04	6.583E+02	5.470E-02			
Y-93			6.649E+03	1.861E+04	1.619E+04	1.224E+04	7.001E+03	4.004E+03	7.490E+02	2.621E+01	1.124E-03	5.898E-11	
Zr-95			1.279E+04	3.832E+04	3.819E+04	3.793E+04	3.743E+04	3.694E+04	3.549E+04	3.276E+04	2.577E+04	1.727E+04	1.158E+04
Zr-97			1.215E+04	3.496E+04	3.213E+04	2.713E+04	1.936E+04	1.381E+04	5.011E+03	6.600E+02	1.509E+00	5.983E-05	2.373E-09
Sum	**1.584E+07**	**4.428E+07**	**1.178E+08**	**2.412E+08**	**2.048E+08**	**1.713E+08**	**1.373E+08**	**1.157E+08**	**8.076E+07**	**5.569E+07**	**2.919E+07**	**1.327E+07**	**7.369E+06**

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TABLE 3. DBA-LOCA REACTOR BUILDING AIRBORNE ACTIVITY

DBA-LOCA REACTOR BUILDING AIRBORNE ACTIVITY (CURIES)													
Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Am-241	0.000E+00	0.000E+00	1.581E-04	1.245E-03	2.245E-03	1.772E-03	9.229E-04	4.757E-04	6.559E-05	1.902E-06	6.093E-07	4.899E-07	3.919E-07
Ba-139	0.000E+00	0.000E+00	7.342E+01	3.497E+02	2.305E+02	2.431E+01	2.259E-01	2.079E-03	1.612E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ba-140	0.000E+00	0.000E+00	1.216E+02	9.556E+02	1.715E+03	1.339E+03	6.830E+02	3.448E+02	4.465E+01	1.143E+00	2.520E-01	1.092E-01	4.736E-02
Ce-141	0.000E+00	0.000E+00	2.796E+00	2.201E+01	3.962E+01	3.113E+01	1.606E+01	8.197E+00	1.097E+00	3.000E-02	8.068E-03	4.869E-03	2.939E-03
Ce-143	0.000E+00	0.000E+00	2.542E+00	1.960E+01	3.388E+01	2.455E+01	1.078E+01	4.683E+00	3.868E-01	4.027E-03	5.979E-05	2.888E-07	1.395E-09
Ce-144	0.000E+00	0.000E+00	2.351E+00	1.851E+01	3.336E+01	2.629E+01	1.364E+01	7.006E+00	9.556E-01	2.713E-02	8.173E-03	5.958E-03	4.343E-03
Cm-242	0.000E+00	0.000E+00	4.138E-02	3.258E-01	5.870E-01	4.624E-01	2.397E-01	1.231E-01	1.676E-02	4.741E-04	1.413E-04	1.011E-04	7.238E-05
Cm-244	0.000E+00	0.000E+00	2.426E-03	1.910E-02	3.443E-02	2.714E-02	1.409E-02	7.243E-03	9.903E-04	2.825E-05	8.629E-06	6.439E-06	4.805E-06
Co-58	0.000E+00	0.000E+00	4.607E-02	3.626E-01	6.531E-01	5.140E-01	2.660E-01	1.363E-01	1.846E-02	5.164E-04	1.488E-04	1.008E-04	6.828E-05
Co-60	0.000E+00	0.000E+00	2.480E-02	1.953E-01	3.520E-01	2.774E-01	1.440E-01	7.404E-02	1.012E-02	2.886E-04	8.801E-05	6.550E-05	4.875E-05
Cs-134	1.225E+01	1.019E+02	4.100E+02	1.621E+03	2.610E+03	2.037E+03	1.056E+03	5.429E+02	7.416E+01	2.098E+00	6.305E-01	4.667E-01	3.454E-01
Cs-136	3.912E+00	3.250E+01	1.306E+02	5.153E+02	8.262E+02	6.393E+02	3.258E+02	1.646E+02	2.134E+01	5.442E-01	1.197E-01	5.267E-02	2.318E-02
Cs-137	9.223E+00	7.669E+01	3.086E+02	1.220E+03	1.965E+03	1.534E+03	7.956E+02	4.090E+02	5.591E+01	1.585E+00	4.786E-01	3.573E-01	2.667E-01
I-131	5.795E+01	4.840E+02	2.122E+03	9.080E+03	1.574E+04	1.479E+04	1.208E+04	1.053E+04	5.758E+03	4.235E+03	2.329E+03	8.710E+02	3.296E+02
I-132	8.136E+01	6.366E+02	2.609E+03	9.849E+03	1.149E+04	5.185E+03	1.694E+03	8.063E+02	1.554E+02	5.018E+01	1.154E+01	1.027E+00	9.144E-02
I-133	1.199E+02	9.914E+02	4.282E+03	1.778E+04	2.903E+04	2.422E+04	1.559E+04	1.071E+04	2.868E+03	5.061E+02	3.846E+00	1.145E-03	3.451E-07
I-134	1.166E+02	7.491E+02	2.216E+03	4.314E+03	1.549E+03	6.247E+01	9.401E-02	1.509E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I-135	1.125E+02	9.079E+02	3.784E+03	1.463E+04	2.070E+04	1.297E+04	4.712E+03	1.826E+03	8.783E+01	5.000E-01	1.276E-07	0.000E+00	0.000E+00
Kr-85	8.228E-01	7.421E+00	6.894E+01	4.611E+02	1.500E+03	3.122E+03	5.107E+03	6.116E+03	3.917E+03	3.546E+03	3.434E+03	3.264E+03	3.103E+03
Kr-85m	1.453E+01	1.245E+02	1.070E+03	6.132E+03	1.464E+04	1.641E+04	7.785E+03	2.704E+03	4.226E+01	2.278E-02	0.000E+00	0.000E+00	0.000E+00
Kr-87	2.723E+01	2.048E+02	1.449E+03	5.618E+03	6.143E+03	1.445E+03	3.019E+01	4.617E-01	6.161E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Kr-88	3.982E+01	3.311E+02	2.723E+03	1.427E+04	2.849E+04	2.233E+04	5.185E+03	8.811E+02	1.613E+00	1.194E-05	0.000E+00	0.000E+00	0.000E+00
La-140	0.000E+00	0.000E+00	2.076E+00	2.665E+01	1.004E+02	1.632E+02	1.628E+02	1.181E+02	2.631E+01	1.008E+00	2.845E-01	1.268E-01	5.501E-02
La-141	0.000E+00	0.000E+00	9.273E-01	6.121E+00	7.754E+00	3.018E+00	3.823E-01	4.793E-02	9.510E-05	5.712E-10	0.000E+00	0.000E+00	0.000E+00
La-142	0.000E+00	0.000E+00	6.912E-01	3.472E+00	2.546E+00	3.323E-01	4.729E-03	6.664E-05	1.856E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Mo-99	0.000E+00	0.000E+00	1.554E+01	1.211E+02	2.138E+02	1.616E+02	7.714E+01	3.646E+01	3.875E+00	6.678E-02	4.499E-03	2.702E-04	1.623E-05
Nb-95	0.000E+00	0.000E+00	1.194E+00	9.401E+00	1.695E+01	1.336E+01	6.935E+00	3.565E+00	4.872E-01	1.388E-02	4.204E-03	3.056E-03	2.195E-03
Nd-147	0.000E+00	0.000E+00	4.503E-01	3.537E+00	6.341E+00	4.946E+00	2.515E+00	1.266E+00	1.625E-01	4.087E-03	8.553E-04	3.398E-04	1.350E-04
Np-239	0.000E+00	0.000E+00	3.258E+01	2.534E+02	4.457E+02	3.345E+02	1.575E+02	7.339E+01	7.477E+00	1.184E-01	6.190E-03	2.436E-04	9.589E-06
Pr-143	0.000E+00	0.000E+00	1.002E+00	7.907E+00	1.433E+01	1.142E+01	6.027E+00	3.132E+00	4.320E-01	1.180E-02	2.749E-03	1.235E-03	5.532E-04
Pu-238	0.000E+00	0.000E+00	7.086E-03	5.580E-02	1.006E-01	7.928E-02	4.117E-02	2.116E-02	2.894E-03	8.260E-05	2.526E-05	1.889E-05	1.412E-05
Pu-239	0.000E+00	0.000E+00	7.526E-04	5.927E-03	1.069E-02	8.428E-03	4.381E-03	2.254E-03	3.089E-04	8.839E-06	2.710E-06	2.025E-06	1.513E-06
Pu-240	0.000E+00	0.000E+00	1.210E-03	9.530E-03	1.718E-02	1.354E-02	7.031E-03	3.614E-03	4.942E-04	1.410E-05	4.310E-06	3.220E-06	2.405E-06
Pu-241	0.000E+00	0.000E+00	2.985E-01	2.350E+00	4.236E+00	3.339E+00	1.734E+00	8.913E-01	1.219E-01	3.476E-03	1.062E-03	7.920E-04	5.908E-04
Rb-86	1.156E-01	9.610E-01	3.864E+00	1.525E+01	2.449E+01	1.900E+01	9.734E+00	4.942E+00	6.510E-01	1.713E-02	4.142E-03	2.134E-03	1.100E-03
Rh-105	0.000E+00	0.000E+00	8.622E+00	6.769E+01	1.205E+02	9.091E+01	4.162E+01	1.848E+01	1.586E+00	1.766E-02	3.209E-04	2.170E-06	1.468E-08
Ru-103	0.000E+00	0.000E+00	1.338E+01	1.053E+02	1.895E+02	1.489E+02	7.687E+01	3.928E+01	5.278E+00	1.454E-01	3.997E-02	2.503E-02	1.567E-02
Ru-105	0.000E+00	0.000E+00	7.913E+00	5.330E+01	7.031E+01	2.968E+01	4.420E+00	6.517E-01	2.103E-03	3.340E-08	0.000E+00	0.000E+00	0.000E+00
Ru-106	0.000E+00	0.000E+00	5.330E+00	4.197E+01	7.563E+01	5.960E+01	3.093E+01	1.589E+01	2.168E+00	6.164E-02	1.863E-02	1.366E-02	1.001E-02
Sb-127	0.000E+00	0.000E+00	1.450E+01	1.133E+02	2.012E+02	1.539E+02	7.528E+01	3.644E+01	4.162E+00	8.285E-02	8.598E-03	1.061E-03	1.310E-04
Sb-129	0.000E+00	0.000E+00	4.599E+01	3.084E+02	4.033E+02	1.673E+02	2.407E+01	3.428E+00	9.968E-03	1.286E-07	0.000E+00	0.000E+00	0.000E+00

TABLE 3. DBA-LOCA REACTOR BUILDING AIRBORNE ACTIVITY

DBA-LOCA REACTOR BUILDING AIRBORNE ACTIVITY (CURIES)													
Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Sr-89	0.000E+00	0.000E+00	6.393E+01	5.031E+02	9.058E+02	7.123E+02	3.682E+02	1.884E+02	2.541E+01	7.054E-01	1.986E-01	1.293E-01	8.420E-02
Sr-90	0.000E+00	0.000E+00	8.152E+00	6.419E+01	1.157E+02	9.120E+01	4.736E+01	2.434E+01	3.329E+00	9.496E-02	2.901E-02	2.166E-02	1.617E-02
Sr-91	0.000E+00	0.000E+00	7.579E+01	5.548E+02	8.642E+02	5.088E+02	1.474E+02	4.226E+01	1.003E+00	8.623E-04	7.210E-09	0.000E+00	0.000E+00
Sr-92	0.000E+00	0.000E+00	6.701E+01	4.086E+02	4.415E+02	1.251E+02	8.395E+00	5.577E-01	1.646E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Tc-99m	0.000E+00	0.000E+00	1.391E+01	1.093E+02	1.959E+02	1.512E+02	7.496E+01	3.654E+01	3.965E+00	6.846E-02	4.612E-03	2.771E-04	1.664E-05
Te-127	0.000E+00	0.000E+00	1.448E+01	1.139E+02	2.048E+02	1.600E+02	8.124E+01	4.069E+01	4.935E+00	1.075E-01	1.683E-02	7.133E-03	4.424E-03
Te-127m	0.000E+00	0.000E+00	2.471E+00	1.946E+01	3.507E+01	2.764E+01	1.435E+01	7.377E+00	1.008E+00	2.861E-02	8.522E-03	6.006E-03	4.214E-03
Te-129	0.000E+00	0.000E+00	4.890E+01	3.548E+02	5.171E+02	2.575E+02	8.167E+01	3.115E+01	3.542E+00	9.658E-02	2.608E-02	1.585E-02	9.634E-03
Te-129m	0.000E+00	0.000E+00	1.035E+01	8.147E+01	1.468E+02	1.155E+02	5.962E+01	3.045E+01	4.080E+00	1.117E-01	3.017E-02	1.833E-02	1.114E-02
Te-131m	0.000E+00	0.000E+00	3.266E+01	2.513E+02	4.325E+02	3.108E+02	1.342E+02	5.733E+01	4.503E+00	4.238E-02	4.650E-04	1.357E-06	3.959E-09
Te-132	0.000E+00	0.000E+00	2.374E+02	1.853E+03	3.282E+03	2.497E+03	1.208E+03	5.783E+02	6.392E+01	1.192E+00	1.017E-01	9.048E-03	8.054E-04
Xe-133	1.180E+02	1.066E+03	9.893E+03	6.603E+04	2.138E+05	4.399E+05	7.020E+05	8.191E+05	5.156E+05	3.894E+05	1.697E+05	4.111E+04	1.004E+04
Xe-135	4.082E+01	4.017E+02	3.742E+03	2.548E+04	8.307E+04	1.576E+05	1.895E+05	1.546E+05	3.765E+04	1.276E+03	2.042E-02	1.781E-10	0.000E+00
Y-90	0.000E+00	0.000E+00	1.173E-01	1.362E+00	4.699E+00	7.405E+00	7.466E+00	5.551E+00	1.351E+00	6.163E-02	2.700E-02	2.166E-02	1.625E-02
Y-91	0.000E+00	0.000E+00	8.385E-01	6.674E+00	1.237E+01	1.022E+01	5.617E+00	2.971E+00	4.149E-01	1.164E-02	3.312E-03	2.197E-03	1.458E-03
Y-92	0.000E+00	0.000E+00	5.848E+00	9.061E+01	2.804E+02	2.124E+02	4.060E+01	5.598E+00	8.878E-03	2.229E-08	0.000E+00	0.000E+00	0.000E+00
Y-93	0.000E+00	0.000E+00	6.206E-01	4.563E+00	7.169E+00	4.295E+00	1.288E+00	3.824E-01	1.007E-02	1.066E-05	1.664E-10	0.000E+00	0.000E+00
Zr-95	0.000E+00	0.000E+00	1.193E+00	9.393E+00	1.692E+01	1.331E+01	6.886E+00	3.527E+00	4.771E-01	1.332E-02	3.816E-03	2.558E-03	1.714E-03
Zr-97	0.000E+00	0.000E+00	1.134E+00	8.570E+00	1.423E+01	9.520E+00	3.561E+00	1.318E+00	6.737E-02	2.684E-04	2.234E-07	8.859E-12	0.000E+00
SUM	**7.550E+02**	**6.117E+03**	**3.575E+04**	**1.839E+05**	**4.430E+05**	**7.102E+05**	**9.496E+05**	**1.010E+06**	**5.664E+05**	**3.990E+05**	**1.755E+05**	**4.525E+04**	**1.347E+04**

For Information Only

TABLE 4. DBA-LOCA TURBINE BUILDING AIRBORNE ACTIVITY

DBA-LOCA TURBINE BUILDING AIRBORNE ACTIVITY (CURIES)													
Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Am-241	0.000E+00	0.000E+00	3.655E-06	2.963E-05	5.998E-05	6.472E-05	6.527E-05	6.545E-05	6.598E-05	6.703E-05	7.020E-05	7.545E-05	8.068E-05
Ba-139	0.000E+00	0.000E+00	1.698E+00	8.323E+00	6.157E+00	8.876E-01	1.598E-02	2.859E-04	1.639E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ba-140	0.000E+00	0.000E+00	2.813E+00	2.275E+01	4.580E+01	4.890E+01	4.830E+01	4.743E+01	4.491E+01	4.027E+01	2.903E+01	1.682E+01	9.751E+00
Ce-141	0.000E+00	0.000E+00	6.466E-02	5.238E-01	1.058E+00	1.137E+00	1.136E+00	1.128E+00	1.104E+00	1.057E+00	9.295E-01	7.499E-01	6.050E-01
Ce-143	0.000E+00	0.000E+00	5.879E-02	4.666E-01	9.049E-01	8.965E-01	7.622E-01	6.443E-01	3.891E-01	1.419E-01	6.889E-03	4.448E-05	2.873E-07
Ce-144	0.000E+00	0.000E+00	5.438E-02	4.407E-01	8.911E-01	9.598E-01	9.645E-01	9.638E-01	9.613E-01	9.564E-01	9.416E-01	9.176E-01	8.943E-01
Cm-242	0.000E+00	0.000E+00	9.570E-04	7.755E-03	1.568E-02	1.688E-02	1.696E-02	1.693E-02	1.686E-02	1.671E-02	1.627E-02	1.557E-02	1.490E-02
Cm-244	0.000E+00	0.000E+00	5.609E-05	4.546E-04	9.195E-04	9.908E-04	9.964E-04	9.964E-04	9.962E-04	9.957E-04	9.942E-04	9.917E-04	9.893E-04
Co-58	0.000E+00	0.000E+00	1.066E-03	8.632E-03	1.745E-02	1.877E-02	1.881E-02	1.875E-02	1.857E-02	1.820E-02	1.715E-02	1.553E-02	1.406E-02
Co-60	0.000E+00	0.000E+00	5.736E-04	4.648E-03	9.402E-03	1.013E-02	1.019E-02	1.019E-02	1.018E-02	1.017E-02	1.014E-02	1.009E-02	1.004E-02
Cs-134	2.848E-01	2.364E+00	9.625E+00	3.910E+01	7.076E+01	7.590E+01	7.690E+01	7.750E+01	7.831E+01	7.982E+01	8.353E+01	8.760E+01	8.986E+01
Cs-136	9.091E-02	7.539E-01	3.067E+00	1.243E+01	2.240E+01	2.382E+01	2.372E+01	2.349E+01	2.253E+01	2.070E+01	1.586E+01	9.887E+00	6.031E+00
Cs-137	2.144E-01	1.779E+00	7.245E+00	2.943E+01	5.327E+01	5.714E+01	5.791E+01	5.838E+01	5.904E+01	6.028E+01	6.340E+01	6.707E+01	6.939E+01
I-131	1.327E+00	1.105E+01	4.895E+01	2.148E+02	4.115E+02	4.942E+02	6.128E+02	7.319E+02	8.750E+02	1.123E+03	1.537E+03	1.436E+03	9.903E+02
I-132	1.864E+00	1.453E+01	6.012E+01	2.323E+02	2.993E+02	1.760E+02	1.072E+02	9.574E+01	7.675E+01	5.014E+01	1.398E+01	1.663E+00	1.979E-01
I-133	2.746E+00	2.264E+01	9.878E+01	4.206E+02	7.590E+02	8.091E+02	7.907E+02	7.444E+02	4.358E+02	1.342E+02	2.542E+00	1.891E-03	1.038E-06
I-134	2.671E+00	1.711E+01	5.111E+01	1.021E+02	4.049E+01	2.087E+00	4.767E-03	1.049E-05	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I-135	2.576E+00	2.074E+01	8.729E+01	3.460E+02	5.411E+02	4.333E+02	2.389E+02	1.269E+02	1.335E+01	1.326E-01	8.432E-08	0.000E+00	0.000E+00
Kr-85	4.337E-02	4.367E-01	2.870E+00	1.720E+01	6.809E+01	2.265E+02	7.668E+02	1.596E+03	3.359E+03	8.630E+03	3.623E+04	1.098E+05	2.025E+05
Kr-85m	7.659E-01	7.324E+00	4.455E+01	2.286E+02	6.644E+02	1.190E+03	1.169E+03	7.056E+02	3.624E+01	5.543E-02	4.670E-11	0.000E+00	0.000E+00
Kr-87	1.435E+00	1.205E+01	6.031E+01	2.095E+02	2.789E+02	1.048E+02	4.532E+00	1.205E-01	5.283E-07	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Kr-88	2.099E+00	1.948E+01	1.133E+02	5.320E+02	1.293E+03	1.620E+03	7.784E+02	2.300E+02	1.384E+00	2.905E-05	0.000E+00	0.000E+00	0.000E+00
La-140	0.000E+00	0.000E+00	4.803E-02	6.367E-01	2.688E+00	5.967E+00	1.152E+01	1.625E+01	2.647E+01	3.554E+01	3.278E+01	1.953E+01	1.133E+01
La-141	0.000E+00	0.000E+00	2.145E-02	1.457E-01	2.071E-01	1.102E-01	2.704E-02	6.594E-03	9.566E-05	2.013E-08	0.000E+00	0.000E+00	0.000E+00
La-142	0.000E+00	0.000E+00	1.599E-02	8.264E-02	6.801E-02	1.213E-02	3.345E-04	9.167E-06	1.888E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Mo-99	0.000E+00	0.000E+00	3.595E-01	2.883E+00	5.710E+00	5.900E+00	5.455E+00	5.016E+00	3.898E+00	2.354E+00	5.183E-01	4.162E-02	3.342E-03
Nb-95	0.000E+00	0.000E+00	2.761E-02	2.238E-01	4.526E-01	4.877E-01	4.904E-01	4.904E-01	4.901E-01	4.892E-01	4.844E-01	4.707E-01	4.519E-01
Nd-147	0.000E+00	0.000E+00	1.041E-02	8.418E-02	1.694E-01	1.806E-01	1.779E-01	1.742E-01	1.635E-01	1.440E-01	9.854E-02	5.234E-02	2.780E-02
Np-239	0.000E+00	0.000E+00	7.535E-01	6.033E+00	1.191E+01	1.222E+01	1.114E+01	1.010E+01	7.521E+00	4.174E+00	7.131E-01	3.752E-02	1.974E-03
Pr-143	0.000E+00	0.000E+00	2.318E-02	1.882E-01	3.828E-01	4.169E-01	4.263E-01	4.309E-01	4.346E-01	4.159E-01	3.168E-01	1.902E-01	1.139E-01
Pu-238	0.000E+00	0.000E+00	1.639E-04	1.328E-03	2.686E-03	2.895E-03	2.911E-03	2.912E-03	2.912E-03	2.911E-03	2.911E-03	2.909E-03	2.908E-03
Pu-239	0.000E+00	0.000E+00	1.741E-05	1.411E-04	2.854E-04	3.077E-04	3.098E-04	3.101E-04	3.107E-04	3.115E-04	3.122E-04	3.119E-04	3.115E-04
Pu-240	0.000E+00	0.000E+00	2.799E-05	2.269E-04	4.588E-04	4.944E-04	4.972E-04	4.972E-04	4.972E-04	4.970E-04	4.966E-04	4.959E-04	4.952E-04
Pu-241	0.000E+00	0.000E+00	6.903E-03	5.595E-02	1.132E-01	1.219E-01	1.226E-01	1.226E-01	1.226E-01	1.225E-01	1.223E-01	1.220E-01	1.216E-01
Rb-86	2.688E-03	2.230E-02	9.074E-02	3.682E-01	6.655E-01	7.168E-01	7.432E-01	7.721E-01	8.029E-01	8.594E-01	9.524E-01	8.924E-01	7.228E-01
Rh-105	0.000E+00	0.000E+00	1.994E-01	1.611E+00	3.218E+00	3.320E+00	2.943E+00	2.542E+00	1.596E+00	6.226E-01	3.698E-02	3.343E-04	3.022E-06
Ru-103	0.000E+00	0.000E+00	3.094E-01	2.506E+00	5.061E+00	5.437E+00	5.436E+00	5.404E+00	5.309E+00	5.124E+00	4.605E+00	3.854E+00	3.226E+00
Ru-105	0.000E+00	0.000E+00	1.830E-01	1.269E+00	1.878E+00	1.084E+00	3.126E-01	8.966E-02	2.115E-03	1.177E-06	0.000E+00	0.000E+00	0.000E+00
Ru-106	0.000E+00	0.000E+00	1.233E-01	9.989E-01	2.020E+00	2.176E+00	2.187E+00	2.186E+00	2.181E+00	2.173E+00	2.146E+00	2.103E+00	2.061E+00
Sb-127	0.000E+00	0.000E+00	3.354E-01	2.698E+00	5.375E+00	5.621E+00	5.324E+00	5.014E+00	4.187E+00	2.920E+00	9.906E-01	1.635E-01	2.697E-02
Sb-129	0.000E+00	0.000E+00	1.064E+00	7.342E+00	1.077E+01	6.110E+00	1.702E+00	4.717E-01	1.003E-02	4.532E-06	0.000E+00	0.000E+00	0.000E+00

For Information Only

TABLE 4. DBA-LOCA TURBINE BUILDING AIRBORNE ACTIVITY

DBA-LOCA TURBINE BUILDING AIRBORNE ACTIVITY (CURIES)													
Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Sr-89	0.000E+00	0.000E+00	1.478E+00	1.198E+01	2.419E+01	2.601E+01	2.604E+01	2.592E+01	2.556E+01	2.486E+01	2.288E+01	1.992E+01	1.734E+01
Sr-90	0.000E+00	0.000E+00	1.885E-01	1.528E+00	3.091E+00	3.330E+00	3.349E+00	3.349E+00	3.348E+00	3.347E+00	3.343E+00	3.336E+00	3.329E+00
Sr-91	0.000E+00	0.000E+00	1.753E+00	1.321E+01	2.308E+01	1.858E+01	1.042E+01	5.814E+00	1.009E+00	3.039E-02	8.307E-07	0.000E+00	0.000E+00
Sr-92	0.000E+00	0.000E+00	1.550E+00	9.725E+00	1.179E+01	4.568E+00	5.937E-01	7.673E-02	1.656E-04	7.707E-10	0.000E+00	0.000E+00	0.000E+00
Tc-99m	0.000E+00	0.000E+00	3.217E-01	2.603E+00	5.232E+00	5.522E+00	5.302E+00	5.027E+00	3.989E+00	2.413E+00	5.314E-01	4.267E-02	3.427E-03
Te-127	0.000E+00	0.000E+00	3.349E-01	2.712E+00	5.470E+00	5.841E+00	5.745E+00	5.598E+00	4.964E+00	3.790E+00	1.939E+00	1.099E+00	9.109E-01
Te-127m	0.000E+00	0.000E+00	5.714E-02	4.631E-01	9.367E-01	1.009E+00	1.015E+00	1.015E+00	1.014E+00	1.009E+00	9.819E-01	9.251E-01	8.677E-01
Te-129	0.000E+00	0.000E+00	1.131E+00	8.446E+00	1.381E+01	9.403E+00	5.775E+00	4.285E+00	3.563E+00	3.404E+00	3.005E+00	2.442E+00	1.984E+00
Te-129m	0.000E+00	0.000E+00	2.393E-01	1.939E+00	3.921E+00	4.216E+00	4.217E+00	4.189E+00	4.104E+00	3.937E+00	3.476E+00	2.824E+00	2.294E+00
Te-131m	0.000E+00	0.000E+00	7.553E-01	5.982E+00	1.155E+01	1.135E+01	9.488E+00	7.887E+00	4.529E+00	1.494E+00	5.357E-02	2.090E-04	8.151E-07
Te-132	0.000E+00	0.000E+00	5.491E+00	4.411E+01	8.765E+01	9.116E+01	8.540E+01	7.956E+01	6.430E+01	4.201E+01	1.171E+01	1.394E+00	1.658E-01
Xe-133	6.213E+00	6.250E+01	4.102E+02	2.449E+03	9.605E+03	3.125E+04	1.012E+05	2.016E+05	3.718E+05	7.336E+05	1.395E+06	1.130E+06	5.566E+05
Xe-135	2.063E+00	2.082E+01	1.382E+02	8.189E+02	2.892E+03	7.074E+03	1.285E+04	1.447E+04	4.907E+03	3.259E+02	2.322E-02	7.894E-10	0.000E+00
Y-90	0.000E+00	0.000E+00	2.714E-03	3.251E-02	1.258E-01	2.708E-01	5.283E-01	7.640E-01	1.360E+00	2.173E+00	3.111E+00	3.336E+00	3.346E+00
Y-91	0.000E+00	0.000E+00	1.939E-02	1.589E-01	3.305E-01	3.732E-01	3.973E-01	4.088E-01	4.175E-01	4.103E-01	3.819E-01	3.388E-01	3.005E-01
Y-92	0.000E+00	0.000E+00	1.354E-01	2.169E+00	7.517E+00	7.770E+00	2.875E+00	7.708E-01	8.938E-03	7.869E-07	0.000E+00	0.000E+00	0.000E+00
Y-93	0.000E+00	0.000E+00	1.435E-02	1.086E-01	1.915E-01	1.568E-01	9.108E-02	5.260E-02	1.013E-02	3.757E-04	1.917E-08	0.000E+00	0.000E+00
Zr-95	0.000E+00	0.000E+00	2.760E-02	2.236E-01	4.518E-01	4.860E-01	4.870E-01	4.853E-01	4.800E-01	4.695E-01	4.396E-01	3.939E-01	3.530E-01
Zr-97	0.000E+00	0.000E+00	2.622E-02	2.040E-01	3.801E-01	3.476E-01	2.518E-01	1.814E-01	6.777E-02	9.460E-03	2.574E-05	1.364E-09	0.000E+00
SUM	**2.440E+01**	**2.136E+02**	**1.157E+03**	**5.818E+03**	**1.730E+04**	**4.383E+04**	**1.189E+05**	**2.207E+05**	**3.818E+05**	**7.443E+05**	**1.433E+06**	**1.241E+06**	**7.604E+05**

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TABLE 5. ACTIVITY BUILDUP ON STANDBY GAS TREATMENT SYSTEM FILTER FOR DBA-LOCA

ACTIVITY BUILDUP ON SGTS FILTER FOR DBA-LOCA (CURIES)

Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci	Ci
Am-241			2.236E-06	5.435E-05	3.815E-04	1.045E-03	1.847E-03	2.204E-03	2.302E-03	1.809E-03	8.045E-04	2.105E-04	5.756E-05
Ba-139			1.039E+00	1.526E+01	3.917E+01	1.433E+01	4.522E-01	9.629E-03	5.720E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ba-140			1.721E+00	4.171E+01	2.913E+02	7.896E+02	1.367E+03	1.597E+03	1.567E+03	1.087E+03	3.327E+02	4.693E+01	6.956E+00
Ce-141			3.956E-02	9.606E-01	6.731E+00	1.835E+01	3.214E+01	3.797E+01	3.852E+01	2.853E+01	1.065E+01	2.092E+00	4.316E-01
Ce-143			3.597E-02	8.557E-01	5.756E+00	1.447E+01	2.157E+01	2.170E+01	1.358E+01	3.830E+00	7.895E-02	1.241E-04	2.049E-07
Ce-144			3.327E-02	8.082E-01	5.669E+00	1.550E+01	2.730E+01	3.246E+01	3.355E+01	2.581E+01	1.079E+01	2.560E+00	6.379E-01
Cm-242			5.855E-04	1.422E-02	9.974E-02	2.726E-01	4.799E-01	5.702E-01	5.883E-01	4.509E-01	1.865E-01	4.344E-02	1.063E-02
Cm-244			3.432E-05	8.338E-04	5.849E-03	1.600E-02	2.820E-02	3.356E-02	3.476E-02	2.687E-02	1.139E-02	2.766E-03	7.057E-04
Co-58	0.000E+00	0.000E+00	6.519E-04	1.583E-02	1.110E-01	3.030E-01	5.324E-01	6.315E-01	6.479E-01	4.911E-01	1.965E-01	4.331E-02	1.003E-02
Co-60			3.509E-04	8.525E-03	5.981E-02	1.636E-01	2.883E-01	3.430E-01	3.553E-01	2.744E-01	1.162E-01	2.814E-02	7.161E-03
Cs-134	2.217E-01	1.623E+00	1.147E+01	9.096E+01	4.803E+02	1.243E+03	2.156E+03	2.555E+03	2.638E+03	2.035E+03	8.586E+02	2.066E+02	5.216E+01
Cs-136	7.076E-02	5.178E-01	3.655E+00	2.892E+01	1.520E+02	3.902E+02	6.651E+02	7.746E+02	7.592E+02	5.277E+02	1.630E+02	2.332E+01	3.501E+00
Cs-137	1.668E-01	1.222E+00	8.635E+00	6.846E+01	3.615E+02	9.361E+02	1.624E+03	1.925E+03	1.989E+03	1.537E+03	6.518E+02	1.582E+02	4.028E+01
I-131	1.047E+00	7.691E+00	5.692E+01	4.913E+02	2.748E+03	7.707E+03	1.568E+04	2.172E+04	3.037E+04	3.428E+04	2.754E+04	1.215E+04	4.760E+03
I-132	1.466E+00	9.963E+00	6.729E+01	4.997E+02	1.943E+03	2.766E+03	3.017E+03	3.244E+03	2.701E+03	1.367E+03	1.634E+02	4.926E+00	1.667E-01
I-133	2.167E+00	1.576E+01	1.149E+02	9.621E+02	5.070E+03	1.262E+04	2.023E+04	2.208E+04	1.512E+04	4.096E+03	4.549E+01	1.598E-02	4.985E-06
I-134	2.108E+00	1.191E+01	5.943E+01	2.334E+02	2.705E+02	3.255E+01	1.219E-01	3.112E-04	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I-135	2.033E+00	1.443E+01	1.015E+02	7.915E+02	3.615E+03	6.759E+03	6.112E+03	3.765E+03	4.631E+02	4.046E+00	1.509E-06	0.000E+00	0.000E+00
La-140			3.060E-02	1.262E+00	1.738E+01	9.657E+01	3.262E+02	5.472E+02	9.239E+02	9.589E+02	3.757E+02	5.447E+01	8.080E+00
La-141			1.312E-02	2.672E-01	1.317E+00	1.779E+00	7.651E-01	2.221E-01	3.338E-03	5.433E-07	0.000E+00	0.000E+00	0.000E+00
La-142			9.780E-03	1.516E-01	4.326E-01	1.959E-01	9.466E-03	3.087E-04	6.582E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Mo-99			2.199E-01	5.287E+00	3.632E+01	9.526E+01	1.544E+02	1.689E+02	1.360E+02	6.351E+01	5.941E+00	1.161E-01	2.384E-03
Nb-95			1.689E-02	4.104E-01	2.879E+00	7.874E+00	1.388E+01	1.651E+01	1.710E+01	1.320E+01	5.552E+00	1.313E+00	3.224E-01
Nd-147			6.372E-03	1.544E-01	1.077E+00	2.916E+00	5.034E+00	5.865E+00	5.705E+00	3.887E+00	1.129E+00	1.460E-01	1.983E-02
Np-239			4.610E-01	1.106E+01	7.574E+01	1.972E+02	3.152E+02	3.400E+02	2.625E+02	1.126E+02	8.174E+00	1.047E-01	1.408E-03
Pr-143			1.418E-02	3.453E-01	2.436E+00	6.732E+00	1.206E+01	1.451E+01	1.517E+01	1.122E+01	3.631E+00	5.305E-01	8.126E-02
Pu-238			1.003E-04	2.436E-03	1.709E-02	4.674E-02	8.240E-02	9.805E-02	1.016E-01	7.856E-02	3.336E-02	8.114E-03	2.074E-03
Pu-239			1.065E-05	2.587E-04	1.816E-03	4.969E-03	8.768E-03	1.044E-02	1.084E-02	8.407E-03	3.578E-03	8.701E-04	2.222E-04
Pu-240			1.712E-05	4.160E-04	2.919E-03	7.982E-03	1.407E-02	1.675E-02	1.735E-02	1.341E-02	5.692E-03	1.383E-03	3.532E-04
Pu-241			4.223E-03	1.026E-01	7.198E-01	1.969E+00	3.470E+00	4.129E+00	4.278E+00	3.306E+00	1.402E+00	3.402E-01	8.678E-02
Rb-86	2.092E-03	1.531E-02	1.081E-01	8.559E-01	4.506E+00	1.160E+01	1.987E+01	2.326E+01	2.316E+01	1.662E+01	5.641E+00	9.448E-01	1.661E-01
Rh-105			1.220E-01	2.955E+00	2.047E+01	5.360E+01	8.330E+01	8.560E+01	5.568E+01	1.680E+01	4.238E-01	9.324E-04	2.156E-06
Ru-103			1.893E-01	4.595E+00	3.219E+01	8.778E+01	1.539E+02	1.820E+02	1.853E+02	1.383E+02	5.278E+01	1.075E+01	2.301E+00
Ru-105			1.120E-01	2.327E+00	1.195E+01	1.750E+01	8.847E+00	3.020E+00	7.382E-02	3.177E-05	0.000E+00	0.000E+00	0.000E+00
Ru-106			7.541E-02	1.832E+00	1.285E+01	3.513E+01	6.190E+01	7.361E+01	7.613E+01	5.862E+01	2.460E+01	5.866E+00	1.470E+00
Sb-127			2.052E-01	4.948E+00	3.419E+01	9.075E+01	1.507E+02	1.688E+02	1.461E+02	7.880E+01	1.135E+01	4.559E-01	1.924E-02
Sb-129			6.507E-01	1.346E+01	6.853E+01	9.865E+01	4.818E+01	1.588E+01	3.499E-01	1.223E-04	0.000E+00	0.000E+00	0.000E+00
Sr-89			9.045E-01	2.196E+01	1.539E+02	4.199E+02	7.369E+02	8.729E+02	8.921E+02	6.709E+02	2.622E+02	5.555E+01	1.237E+01
Sr-90			1.153E-01	2.802E+00	1.966E+01	5.377E+01	9.479E+01	1.128E+02	1.169E+02	9.031E+01	3.831E+01	9.304E+00	2.375E+00
Sr-91			1.072E+00	2.422E+01	1.468E+02	2.999E+02	2.950E+02	1.958E+02	3.521E+01	8.201E-01	9.520E-06	0.000E+00	0.000E+00

TABLE 5. ACTIVITY BUILDUP ON STANDBY GAS TREATMENT SYSTEM FILTER FOR DBA-LOCA

ACTIVITY BUILDUP ON SGTS FILTER FOR DBA-LOCA (CURIES)

Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Sr-92			9.481E-01	1.784E+01	7.502E+01	7.376E+01	1.680E+01	2.584E+00	5.777E-03	2.080E-08	0.000E+00	0.000E+00	0.000E+00
Tc-99m			1.968E-01	4.773E+00	3.328E+01	8.915E+01	1.501E+02	1.693E+02	1.392E+02	6.512E+01	6.091E+00	1.190E-01	2.444E-03
Te-127			2.049E-01	4.974E+00	3.480E+01	9.431E+01	1.626E+02	1.885E+02	1.732E+02	1.023E+02	2.222E+01	3.064E+00	6.498E-01
Te-127m			3.496E-02	8.493E-01	5.959E+00	1.630E+01	2.873E+01	3.418E+01	3.537E+01	2.721E+01	1.125E+01	2.580E+00	6.190E-01
Te-129			6.919E-01	1.549E+01	8.786E+01	1.518E+02	1.635E+02	1.443E+02	1.243E+02	9.186E+01	3.444E+01	6.810E+00	1.415E+00
Te-129m			1.464E-01	3.557E+00	2.494E+01	6.808E+01	1.193E+02	1.411E+02	1.432E+02	1.062E+02	3.983E+01	7.876E+00	1.636E+00
Te-131m			4.621E-01	1.097E+01	7.349E+01	1.832E+02	2.685E+02	2.656E+02	1.581E+02	4.030E+01	6.140E-01	5.829E-04	5.815E-07
Te-132			3.359E+00	8.090E+01	5.576E+02	1.472E+03	2.417E+03	2.679E+03	2.244E+03	1.134E+03	1.342E+02	3.887E+00	1.183E-01
Y-90			1.712E-03	6.362E-02	8.124E-01	4.382E+00	1.496E+01	2.573E+01	4.745E+01	5.862E+01	3.566E+01	9.305E+00	2.387E+00
Y-91			1.187E-02	2.921E-01	2.105E+00	6.028E+00	1.125E+01	1.377E+01	1.457E+01	1.107E+01	4.377E+00	9.449E-01	2.143E-01
Y-92			9.070E-02	4.474E+00	4.883E+01	1.259E+02	8.141E+01	2.596E+01	3.119E-01	2.123E-05	0.000E+00	0.000E+00	0.000E+00
Y-93			8.781E-03	1.992E-01	1.218E+00	2.532E+00	2.578E+00	1.771E+00	3.535E-01	1.014E-02	2.197E-07	0.000E+00	0.000E+00
Zr-95			1.689E-02	4.101E-01	2.874E+00	7.846E+00	1.378E+01	1.634E+01	1.675E+01	1.267E+01	5.038E+00	1.099E+00	2.518E-01
Zr-97			1.604E-02	3.741E-01	2.418E+00	5.613E+00	7.127E+00	6.108E+00	2.365E+00	2.553E-01	2.950E-04	3.806E-09	0.000E+00
SUM	9.283E+00	6.312E+01	4.372E+02	3.470E+03	1.658E+04	3.719E+04	5.687E+04	6.430E+04	6.170E+04	4.888E+04	3.087E+04	1.277E+04	4.899E+03

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For Information Only

TABLE 6. DBA-LOCA PRIMARY CONTAINMENT AIRBORNE ACTIVITY CONCENTRATION

DBA-LOCA PRIMARY CONTAINMENT AIRBORNE ACTIVITY CONCENTRATION (µCi/cc)													
Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Am-241	0.000E+00	0.000E+00	2.250E-04	5.819E-04	6.882E-05	3.426E-06	4.224E-08	6.608E-10	6.014E-11	4.981E-13	2.826E-19	0.000E+00	0.000E+00
Ba-139	0.000E+00	0.000E+00	1.045E+02	1.634E+02	7.065E+00	4.699E-02	1.034E-05	2.887E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ba-140	0.000E+00	0.000E+00	1.731E+02	4.467E+02	5.255E+01	2.589E+00	3.126E-02	4.789E-04	4.095E-05	2.993E-07	1.169E-13	0.000E+00	0.000E+00
Ce-141	0.000E+00	0.000E+00	3.980E+00	1.029E+01	1.214E+00	6.019E-02	7.349E-04	1.139E-05	1.006E-06	7.858E-09	3.742E-15	0.000E+00	0.000E+00
Ce-143	0.000E+00	0.000E+00	3.618E+00	9.162E+00	1.038E+00	4.746E-02	4.932E-04	6.505E-06	3.547E-07	1.055E-09	0.000E+00	0.000E+00	0.000E+00
Ce-144	0.000E+00	0.000E+00	3.347E+00	8.654E+00	1.023E+00	5.082E-02	6.242E-04	9.731E-06	8.764E-07	7.107E-09	3.791E-15	0.000E+00	0.000E+00
Cm-242	0.000E+00	0.000E+00	5.890E-02	1.523E-01	1.799E-02	8.938E-04	1.097E-05	1.710E-07	1.537E-08	1.242E-10	6.552E-17	0.000E+00	0.000E+00
Cm-244	0.000E+00	0.000E+00	3.452E-03	8.928E-03	1.055E-03	5.246E-05	6.449E-07	1.006E-08	9.082E-10	7.400E-12	4.003E-18	0.000E+00	0.000E+00
Co-58	0.000E+00	0.000E+00	6.557E-02	1.695E-01	2.002E-02	9.936E-04	1.217E-05	1.893E-07	1.693E-08	1.353E-10	6.904E-17	0.000E+00	0.000E+00
Co-60	0.000E+00	0.000E+00	3.530E-02	9.128E-02	1.079E-02	5.363E-04	6.593E-06	1.028E-07	9.281E-09	7.558E-11	4.082E-17	0.000E+00	0.000E+00
Cs-134	5.304E+01	1.409E+02	3.158E+02	6.054E+02	7.154E+01	3.556E+00	4.371E-02	6.817E-04	6.148E-05	5.002E-07	2.692E-13	0.000E+00	0.000E+00
Cs-136	1.693E+01	4.494E+01	1.006E+02	1.925E+02	2.265E+01	1.116E+00	1.348E-02	2.066E-04	1.769E-05	1.297E-07	5.111E-14	0.000E+00	0.000E+00
Cs-137	3.992E+01	1.060E+02	2.377E+02	4.556E+02	5.385E+01	2.677E+00	3.291E-02	5.135E-04	4.635E-05	3.777E-07	2.044E-13	0.000E+00	0.000E+00
I-131	2.472E+02	6.606E+02	1.719E+03	3.468E+03	6.123E+02	2.476E+02	2.220E+02	2.148E+02	1.961E+02	1.635E+02	9.463E+01	3.805E+01	1.530E+01
I-132	3.498E+02	8.930E+02	2.248E+03	4.172E+03	4.649E+02	6.696E+01	5.943E+00	5.358E-01	4.856E-04	5.399E-07	8.151E-14	0.000E+00	0.000E+00
I-133	5.115E+02	1.353E+03	3.468E+03	6.791E+03	1.129E+03	4.055E+02	2.866E+02	2.186E+02	9.777E+01	1.956E+01	1.565E-01	5.010E-05	1.604E-08
I-134	4.975E+02	1.022E+03	1.795E+03	1.648E+03	6.025E+01	1.046E+00	1.728E-03	3.081E-06	1.759E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I-135	4.798E+02	1.239E+03	3.065E+03	5.586E+03	8.052E+02	2.172E+02	8.661E+01	3.727E+01	2.994E+00	1.932E-02	5.191E-09	0.000E+00	0.000E+00
Kr-85	3.636E+00	1.090E+01	7.996E+01	2.180E+02	2.179E+02	2.175E+02	2.168E+02	2.161E+02	2.150E+02	2.128E+02	2.065E+02	1.963E+02	1.866E+02
Kr-85m	6.420E+01	1.829E+02	1.241E+03	2.899E+03	2.126E+03	1.143E+03	3.304E+02	9.553E+01	2.319E+00	1.367E-03	2.799E-13	0.000E+00	0.000E+00
Kr-87	1.203E+02	3.009E+02	1.680E+03	2.656E+03	8.922E+02	1.007E+02	1.281E+00	1.631E-02	3.381E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Kr-88	1.760E+02	4.865E+02	3.158E+03	6.746E+03	4.137E+03	1.556E+03	2.201E+02	3.113E+01	8.855E-02	7.163E-07	0.000E+00	0.000E+00	0.000E+00
La-140	0.000E+00	0.000E+00	2.704E+00	1.030E+01	2.960E+00	3.105E-01	7.400E-03	1.633E-04	2.409E-05	2.639E-07	1.320E-13	0.000E+00	0.000E+00
La-141	0.000E+00	0.000E+00	1.320E+00	2.861E+00	2.377E-01	5.835E-03	1.750E-05	6.658E-08	8.721E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00
La-142	0.000E+00	0.000E+00	9.838E-01	1.623E+00	7.804E-02	6.423E-04	2.164E-07	9.256E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Mo-99	0.000E+00	0.000E+00	2.212E+01	5.662E+01	6.553E+00	3.124E-01	3.531E-03	5.065E-05	3.553E-06	1.749E-08	2.087E-15	0.000E+00	0.000E+00
Nb-95	0.000E+00	0.000E+00	1.699E+00	4.395E+00	5.194E-01	2.582E-02	3.174E-04	4.952E-06	4.468E-07	3.635E-09	1.950E-15	0.000E+00	0.000E+00
Nd-147	0.000E+00	0.000E+00	6.409E-01	1.653E+00	1.944E-01	9.561E-03	1.151E-04	1.758E-06	1.490E-07	1.070E-09	3.967E-16	0.000E+00	0.000E+00
Np-239	0.000E+00	0.000E+00	4.637E+01	1.185E+02	1.366E+01	6.467E-01	7.207E-03	1.019E-04	6.856E-06	3.102E-08	2.871E-15	0.000E+00	0.000E+00
Pr-143	0.000E+00	0.000E+00	1.426E+00	3.693E+00	4.391E-01	2.206E-02	2.757E-04	4.349E-06	3.960E-07	3.090E-09	1.275E-15	0.000E+00	0.000E+00
Pu-238	0.000E+00	0.000E+00	1.009E-02	2.608E-02	3.083E-03	1.533E-04	1.884E-06	2.940E-08	2.654E-09	2.164E-11	1.172E-17	0.000E+00	0.000E+00
Pu-239	0.000E+00	0.000E+00	1.071E-03	2.770E-03	3.275E-04	1.629E-05	2.005E-07	3.131E-09	2.833E-10	2.315E-12	1.257E-18	0.000E+00	0.000E+00
Pu-240	0.000E+00	0.000E+00	1.723E-03	4.455E-03	5.265E-04	2.618E-05	3.218E-07	5.021E-09	4.532E-10	3.694E-12	1.999E-18	0.000E+00	0.000E+00
Pu-241	0.000E+00	0.000E+00	4.248E-01	1.099E+00	1.299E-01	6.455E-03	7.936E-05	1.238E-06	1.118E-07	9.105E-10	4.924E-16	0.000E+00	0.000E+00
Rb-86	5.005E-01	1.329E+00	2.976E+00	5.696E+00	6.712E-01	3.316E-02	4.027E-04	6.205E-06	5.398E-07	4.084E-09	1.769E-15	0.000E+00	0.000E+00
Rh-105	0.000E+00	0.000E+00	1.227E+01	3.164E+01	3.693E+00	1.758E-01	1.905E-03	2.566E-05	1.455E-06	4.627E-09	0.000E+00	0.000E+00	0.000E+00
Ru-103	0.000E+00	0.000E+00	1.904E+01	4.920E+01	5.807E+00	2.879E-01	3.518E-03	5.457E-05	4.840E-06	3.808E-08	1.854E-14	0.000E+00	0.000E+00
Ru-105	0.000E+00	0.000E+00	1.126E+01	2.491E+01	2.155E+00	5.737E-02	2.023E-04	9.053E-07	1.928E-09	8.749E-15	0.000E+00	0.000E+00	0.000E+00
Ru-106	0.000E+00	0.000E+00	7.586E+00	1.962E+01	2.318E+00	1.152E-01	1.415E-03	2.207E-05	1.989E-06	1.615E-08	8.641E-15	0.000E+00	0.000E+00
Sb-127	0.000E+00	0.000E+00	2.064E+01	5.298E+01	6.168E+00	2.976E-01	3.445E-03	5.063E-05	3.817E-06	2.170E-08	3.988E-15	0.000E+00	0.000E+00
Sb-129	0.000E+00	0.000E+00	6.545E+01	1.442E+02	1.236E+01	3.235E-01	1.102E-03	4.762E-06	9.141E-09	3.368E-14	0.000E+00	0.000E+00	0.000E+00

TABLE 6. DBA-LOCA PRIMARY CONTAINMENT AIRBORNE ACTIVITY CONCENTRATION

DBA-LOCA PRIMARY CONTAINMENT AIRBORNE ACTIVITY CONCENTRATION (µCi/cc)

Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Sr-89	0.000E+00	0.000E+00	9.098E+01	2.352E+02	2.776E+01	1.377E+00	1.685E-02	2.617E-04	2.330E-05	1.848E-07	9.211E-14	0.000E+00	0.000E+00
Sr-90	0.000E+00	0.000E+00	1.160E+01	3.001E+01	3.546E+00	1.763E-01	2.167E-03	3.382E-05	3.053E-06	2.487E-08	1.346E-14	0.000E+00	0.000E+00
Sr-91	0.000E+00	0.000E+00	1.079E+02	2.593E+02	2.649E+01	9.835E-01	6.745E-03	5.870E-05	9.199E-07	2.259E-10	0.000E+00	0.000E+00	0.000E+00
Sr-92	0.000E+00	0.000E+00	9.537E+01	1.910E+02	1.353E+01	2.419E-01	3.842E-04	7.747E-07	1.509E-10	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Tc-99m	0.000E+00	0.000E+00	1.980E+01	5.111E+01	6.003E+00	2.923E-01	3.431E-03	5.075E-05	3.636E-06	1.793E-08	2.139E-15	0.000E+00	0.000E+00
Te-127	0.000E+00	0.000E+00	2.061E+01	5.325E+01	6.277E+00	3.092E-01	3.718E-03	5.652E-05	4.526E-06	2.817E-08	7.806E-15	0.000E+00	0.000E+00
Te-127m	0.000E+00	0.000E+00	3.517E+00	9.094E+00	1.075E+00	5.344E-02	6.569E-04	1.025E-05	9.240E-07	7.495E-09	3.953E-15	0.000E+00	0.000E+00
Te-129	0.000E+00	0.000E+00	6.960E+01	1.659E+02	1.585E+01	4.978E-01	3.738E-03	4.326E-05	3.248E-06	2.530E-08	1.210E-14	0.000E+00	0.000E+00
Te-129m	0.000E+00	0.000E+00	1.473E+01	3.808E+01	4.499E+00	2.232E-01	2.729E-03	4.230E-05	3.741E-06	2.926E-08	1.399E-14	0.000E+00	0.000E+00
Te-131m	0.000E+00	0.000E+00	4.648E+01	1.175E+02	1.326E+01	6.009E-01	6.140E-03	7.963E-05	4.129E-06	1.110E-08	0.000E+00	0.000E+00	0.000E+00
Te-132	0.000E+00	0.000E+00	3.379E+02	8.662E+02	1.006E+02	4.826E+00	5.527E-02	8.033E-04	5.862E-05	3.122E-07	4.715E-14	0.000E+00	0.000E+00
Xe-133	5.211E+02	1.563E+03	1.145E+04	3.114E+04	3.081E+04	3.010E+04	2.872E+04	2.740E+04	2.391E+04	1.819E+04	7.995E+03	2.031E+03	5.158E+02
Xe-135	1.755E+02	5.426E+02	4.043E+03	1.121E+04	9.885E+03	7.353E+03	4.034E+03	2.208E+03	3.593E+02	9.289E+00	1.544E-04	1.657E-12	0.000E+00
Y-90	0.000E+00	0.000E+00	1.564E-01	5.450E-01	1.391E-01	1.410E-02	3.393E-04	7.676E-06	1.237E-06	1.613E-08	1.252E-14	0.000E+00	0.000E+00
Y-91	0.000E+00	0.000E+00	1.191E+00	3.104E+00	3.783E-01	1.972E-02	2.566E-04	4.119E-06	3.799E-07	3.043E-09	1.535E-15	0.000E+00	0.000E+00
Y-92	0.000E+00	0.000E+00	6.706E+00	3.112E+01	8.173E+00	4.018E-01	1.836E-03	7.704E-06	8.083E-09	5.804E-15	0.000E+00	0.000E+00	0.000E+00
Y-93	0.000E+00	0.000E+00	8.833E-01	2.133E+00	2.198E-01	8.302E-03	5.894E-05	5.311E-07	9.235E-09	2.792E-12	0.000E+00	0.000E+00	0.000E+00
Zr-95	0.000E+00	0.000E+00	1.699E+00	4.391E+00	5.185E-01	2.573E-02	3.152E-04	4.900E-06	4.376E-07	3.489E-09	1.770E-15	0.000E+00	0.000E+00
Zr-97	0.000E+00	0.000E+00	1.614E+00	4.006E+00	4.362E-01	1.840E-02	1.630E-04	1.831E-06	6.178E-08	7.031E-11	0.000E+00	0.000E+00	0.000E+00
SUM	**3.257E+03**	**8.548E+03**	**3.593E+04**	**8.102E+04**	**5.163E+04**	**4.143E+04**	**3.412E+04**	**3.043E+04**	**2.479E+04**	**1.860E+04**	**8.296E+03**	**2.265E+03**	**7.177E+02**

Note:
Containment Airborne Activity Concentration (µCi/cc) = (Corresponding Table 1 Activity Ci x 1000000 µCi/Ci) / (239593 ft3 x 28316.85 cc/ ft3)

For Information Only

TABLE 7. DBA-LOCA SUPPRESSION POOL ACTIVITY CONCENTRATION

DBA-LOCA SUPPRESSION POOL ACTIVITY CONCENTRATION (µCi/cc)

Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Am-241	0.000E+00	0.000E+00	4.530E-04	1.359E-03	1.356E-03	1.351E-03	1.342E-03	1.333E-03	1.305E-03	1.251E-03	1.101E-03	8.851E-04	7.080E-04
Ba-139	0.000E+00	0.000E+00	2.104E+02	3.816E+02	1.392E+02	1.854E+01	3.285E-01	5.823E-03	3.242E-08	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ba-140	0.000E+00	0.000E+00	3.486E+02	1.043E+03	1.036E+03	1.021E+03	9.932E+02	9.659E+02	8.885E+02	7.517E+02	4.553E+02	1.974E+02	8.557E+01
Ce-141	0.000E+00	0.000E+00	8.014E+00	2.402E+01	2.393E+01	2.374E+01	2.335E+01	2.296E+01	2.183E+01	1.974E+01	1.458E+01	8.798E+00	5.310E+00
Ce-143	0.000E+00	0.000E+00	7.286E+00	2.139E+01	2.046E+01	1.872E+01	1.567E+01	1.312E+01	7.697E+00	2.649E+00	1.080E-01	5.219E-04	2.521E-06
Ce-144	0.000E+00	0.000E+00	6.739E+00	2.020E+01	2.015E+01	2.004E+01	1.983E+01	1.963E+01	1.902E+01	1.785E+01	1.477E+01	1.076E+01	7.848E+00
Cm-242	0.000E+00	0.000E+00	1.186E-01	3.555E-01	3.545E-01	3.526E-01	3.487E-01	3.448E-01	3.335E-01	3.119E-01	2.552E-01	1.827E-01	1.308E-01
Cm-244	0.000E+00	0.000E+00	6.952E-03	2.084E-02	2.079E-02	2.069E-02	2.049E-02	2.029E-02	1.971E-02	1.858E-02	1.559E-02	1.163E-02	8.682E-03
Co-58	0.000E+00	0.000E+00	1.320E-01	3.957E-01	3.945E-01	3.919E-01	3.869E-01	3.819E-01	3.673E-01	3.397E-01	2.689E-01	1.821E-01	1.234E-01
Co-60	0.000E+00	0.000E+00	7.108E-02	2.131E-01	2.126E-01	2.115E-01	2.095E-01	2.074E-01	2.014E-01	1.898E-01	1.590E-01	1.184E-01	8.809E-02
Cs-134	1.025E+02	3.073E+02	7.169E+02	1.535E+03	1.531E+03	1.524E+03	1.509E+03	1.493E+03	1.449E+03	1.365E+03	1.139E+03	8.431E+02	6.241E+02
Cs-136	3.271E+01	9.802E+01	2.284E+02	4.881E+02	4.847E+02	4.782E+02	4.653E+02	4.527E+02	4.170E+02	3.539E+02	2.163E+02	9.517E+01	4.188E+01
Cs-137	7.714E+01	2.313E+02	5.396E+02	1.156E+03	1.153E+03	1.147E+03	1.136E+03	1.125E+03	1.093E+03	1.031E+03	8.648E+02	6.455E+02	4.819E+02
I-131	4.762E+02	1.426E+03	3.797E+03	8.510E+03	8.430E+03	8.272E+03	7.965E+03	7.669E+03	6.841E+03	5.437E+03	2.723E+03	8.589E+02	2.709E+02
I-132	6.734E+02	1.920E+03	4.902E+03	9.927E+03	6.338E+03	3.262E+03	2.105E+03	1.935E+03	1.518E+03	9.359E+02	2.192E+02	1.951E+01	1.737E+00
I-133	9.852E+02	2.922E+03	7.661E+03	1.666E+04	1.555E+04	1.354E+04	1.027E+04	7.794E+03	3.402E+03	6.482E+02	4.484E+00	1.126E-03	2.828E-07
I-134	9.582E+02	2.208E+03	3.964E+03	4.043E+03	8.296E+02	3.493E+01	6.194E-02	1.098E-04	6.122E-13	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I-135	9.241E+02	2.676E+03	6.770E+03	1.371E+04	1.109E+04	7.253E+03	3.104E+03	1.329E+03	1.042E+02	6.404E-01	1.487E-07	0.000E+00	0.000E+00
La-140	0.000E+00	0.000E+00	5.499E+00	2.526E+01	5.949E+01	1.236E+02	2.360E+02	3.301E+02	5.232E+02	6.631E+02	5.140E+02	2.291E+02	9.939E+01
La-141	0.000E+00	0.000E+00	2.658E+00	6.680E+00	4.683E+00	2.302E+00	5.559E-01	1.343E-01	1.892E-03	3.758E-07	0.000E+00	0.000E+00	0.000E+00
La-142	0.000E+00	0.000E+00	1.980E+00	3.789E+00	1.538E+00	2.534E-01	6.878E-03	1.867E-04	3.734E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Mo-99	0.000E+00	0.000E+00	4.455E+01	1.322E+02	1.291E+02	1.232E+02	1.122E+02	1.021E+02	7.710E+01	4.393E+01	8.128E+00	4.883E-01	2.933E-02
Nb-95	0.000E+00	0.000E+00	3.422E+00	1.026E+01	1.023E+01	1.018E+01	1.009E+01	9.986E+00	9.694E+00	9.131E+00	7.596E+00	5.522E+00	3.965E+00
Nd-147	0.000E+00	0.000E+00	1.291E+00	3.859E+00	3.830E+00	3.771E+00	3.657E+00	3.546E+00	3.234E+00	2.688E+00	1.545E+00	6.140E-01	2.440E-01
Np-239	0.000E+00	0.000E+00	9.339E+01	2.766E+02	2.692E+02	2.551E+02	2.290E+02	2.056E+02	1.488E+02	7.790E+01	1.118E+01	4.402E-01	1.733E-02
Pr-143	0.000E+00	0.000E+00	2.871E+00	8.623E+00	8.654E+00	8.705E+00	8.763E+00	8.774E+00	8.595E+00	7.761E+00	4.967E+00	2.231E+00	9.995E-01
Pu-238	0.000E+00	0.000E+00	2.031E-02	6.089E-02	6.074E-02	6.045E-02	5.987E-02	5.929E-02	5.759E-02	5.434E-02	4.564E-02	3.413E-02	2.552E-02
Pu-239	0.000E+00	0.000E+00	2.157E-03	6.468E-03	6.454E-03	6.426E-03	6.371E-03	6.315E-03	6.147E-03	5.815E-03	4.896E-03	3.659E-03	2.733E-03
Pu-240	0.000E+00	0.000E+00	3.469E-03	1.040E-02	1.037E-02	1.032E-02	1.022E-02	1.013E-02	9.835E-03	9.277E-03	7.788E-03	5.817E-03	4.345E-03
Pu-241	0.000E+00	0.000E+00	8.555E-01	2.565E+00	2.559E+00	2.546E+00	2.521E+00	2.497E+00	2.425E+00	2.287E+00	1.918E+00	1.431E+00	1.067E+00
Rb-86	9.671E-01	2.898E+00	6.756E+00	1.445E+01	1.437E+01	1.421E+01	1.390E+01	1.359E+01	1.272E+01	1.114E+01	7.485E+00	3.856E+00	1.987E+00
Rh-105	0.000E+00	0.000E+00	2.471E+01	7.387E+01	7.277E+01	6.932E+01	6.052E+01	5.176E+01	3.156E+01	1.162E+01	5.799E-01	3.922E-03	2.652E-05
Ru-103	0.000E+00	0.000E+00	3.834E+01	1.149E+02	1.144E+02	1.135E+02	1.118E+02	1.101E+02	1.050E+02	9.563E+01	7.221E+01	4.521E+01	2.831E+01
Ru-105	0.000E+00	0.000E+00	2.268E+01	5.816E+01	4.246E+01	2.263E+01	6.428E+00	1.826E+00	4.184E-02	2.197E-05	3.182E-15	0.000E+00	0.000E+00
Ru-106	0.000E+00	0.000E+00	1.528E+01	4.580E+01	4.568E+01	4.544E+01	4.497E+01	4.451E+01	4.315E+01	4.055E+01	3.366E+01	2.467E+01	1.809E+01
Sb-127	0.000E+00	0.000E+00	4.156E+01	1.237E+02	1.215E+02	1.174E+02	1.095E+02	1.021E+02	8.283E+01	5.451E+01	1.553E+01	1.917E+00	2.367E-01
Sb-129	0.000E+00	0.000E+00	1.318E+02	3.366E+02	2.436E+02	1.276E+02	3.501E+01	9.605E+00	1.983E-01	8.459E-05	6.561E-15	0.000E+00	0.000E+00
Sr-89	0.000E+00	0.000E+00	1.832E+02	5.490E+02	5.471E+02	5.432E+02	5.354E+02	5.278E+02	5.057E+02	4.641E+02	3.588E+02	2.336E+02	1.521E+02
Sr-90	0.000E+00	0.000E+00	2.336E+01	7.005E+01	6.988E+01	6.954E+01	6.887E+01	6.820E+01	6.623E+01	6.247E+01	5.242E+01	3.913E+01	2.921E+01
Sr-91	0.000E+00	0.000E+00	2.172E+02	6.054E+02	5.219E+02	3.879E+02	2.143E+02	1.184E+02	1.996E+01	5.673E-01	1.303E-05	2.416E-13	0.000E+00
Sr-92	0.000E+00	0.000E+00	1.921E+02	4.458E+02	2.667E+02	9.540E+01	1.221E+01	1.562E+00	3.275E-03	1.439E-08	0.000E+00	0.000E+00	0.000E+00

For Information Only

TABLE 7. DBA-LOCA SUPPRESSION POOL ACTIVITY CONCENTRATION

DBA-LOCA SUPPRESSION POOL ACTIVITY CONCENTRATION (μCi/cc)

Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Tc-99m	0.000E+00	0.000E+00	3.987E+01	1.193E+02	1.183E+02	1.153E+02	1.090E+02	1.024E+02	7.890E+01	4.504E+01	8.333E+00	5.006E-01	3.007E-02
Te-127	0.000E+00	0.000E+00	4.150E+01	1.243E+02	1.237E+02	1.220E+02	1.181E+02	1.140E+02	9.820E+01	7.075E+01	3.041E+01	1.289E+01	7.994E+00
Te-127m	0.000E+00	0.000E+00	7.081E+00	2.123E+01	2.118E+01	2.108E+01	2.087E+01	2.067E+01	2.005E+01	1.882E+01	1.540E+01	1.085E+01	7.614E+00
Te-129	0.000E+00	0.000E+00	1.402E+02	3.872E+02	3.123E+02	1.964E+02	1.188E+02	8.726E+01	7.047E+01	6.354E+01	4.713E+01	2.864E+01	1.741E+01
Te-129m	0.000E+00	0.000E+00	2.966E+01	8.891E+01	8.865E+01	8.805E+01	8.671E+01	8.531E+01	8.118E+01	7.348E+01	5.450E+01	3.312E+01	2.013E+01
Te-131m	0.000E+00	0.000E+00	9.361E+01	2.743E+02	2.612E+02	2.370E+02	1.951E+02	1.606E+02	8.959E+01	2.788E+01	8.401E-01	2.451E-03	7.153E-06
Te-132	0.000E+00	0.000E+00	6.805E+02	2.022E+03	1.982E+03	1.904E+03	1.756E+03	1.620E+03	1.272E+03	7.841E+02	1.837E+02	1.635E+01	1.455E+00
Xe-133	6.658E-01	4.635E+00	2.006E+01	8.750E+01	2.572E+02	5.565E+02	1.020E+03	1.340E+03	1.763E+03	1.626E+03	6.642E+02	1.325E+02	2.640E+01
Xe-135	7.601E+00	5.168E+01	2.159E+02	8.770E+02	2.236E+03	3.640E+03	3.798E+03	2.848E+03	6.858E+02	2.109E+01	3.227E-04	2.720E-12	0.000E+00
Y-90	0.000E+00	0.000E+00	3.172E-01	1.324E+00	2.790E+00	5.609E+00	1.082E+01	1.552E+01	2.687E+01	4.053E+01	4.879E+01	3.914E+01	2.936E+01
Y-91	0.000E+00	0.000E+00	2.400E+00	7.255E+00	7.463E+00	7.785E+00	8.161E+00	8.317E+00	8.251E+00	7.652E+00	5.984E+00	3.970E+00	2.634E+00
Y-92	0.000E+00	0.000E+00	1.384E+01	7.895E+01	1.653E+02	1.604E+02	5.875E+01	1.562E+01	1.761E-01	1.463E-05	0.000E+00	0.000E+00	0.000E+00
Y-93	0.000E+00	0.000E+00	1.779E+00	4.979E+00	4.330E+00	3.275E+00	1.873E+00	1.071E+00	2.004E-01	7.013E-03	3.006E-07	1.578E-14	0.000E+00
Zr-95	0.000E+00	0.000E+00	3.420E+00	1.025E+01	1.022E+01	1.015E+01	1.001E+01	9.881E+00	9.494E+00	8.764E+00	6.894E+00	4.621E+00	3.097E+00
Zr-97	0.000E+00	0.000E+00	3.250E+00	9.352E+00	8.595E+00	7.259E+00	5.178E+00	3.694E+00	1.341E+00	1.766E-01	4.036E-04	1.601E-08	6.348E-13
Sum	**4.239E+03**	**1.185E+04**	**3.151E+04**	**6.454E+04**	**5.479E+04**	**4.583E+04**	**3.674E+04**	**3.096E+04**	**2.161E+04**	**1.490E+04**	**7.808E+03**	**3.551E+03**	**1.971E+03**

Note:
Suppression Pool Activity Concentration (μCi/cc) = (Corresponding Table 2 Activity Ci x 1000000 μCi/Ci) / (132000 ft3 x 28316.85 cc/ ft3)

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TABLE 8. DBA-LOCA REACTOR BUILDING AIRBORNE ACTIVITY CONCENTRATION

DBA-LOCA REACTOR BUILDING AIRBORNE ACTIVITY CONCENTRATION (µCi/cc)													
Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Am-241	0.000E+00	0.000E+00	2.686E-09	2.115E-08	3.815E-08	3.012E-08	1.568E-08	8.084E-09	1.114E-09	3.232E-11	1.035E-11	8.324E-12	6.659E-12
Ba-139	0.000E+00	0.000E+00	1.248E-03	5.941E-03	3.917E-03	4.130E-04	3.839E-06	3.532E-08	2.739E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ba-140	0.000E+00	0.000E+00	2.067E-03	1.624E-02	2.913E-02	2.276E-02	1.160E-02	5.859E-03	7.587E-04	1.941E-05	4.282E-06	1.856E-06	8.047E-07
Ce-141	0.000E+00	0.000E+00	4.751E-05	3.739E-04	6.732E-04	5.290E-04	2.728E-04	1.393E-04	1.864E-05	5.097E-07	1.371E-07	8.274E-08	4.993E-08
Ce-143	0.000E+00	0.000E+00	4.320E-05	3.331E-04	5.757E-04	4.172E-04	1.831E-04	7.958E-05	6.573E-06	6.843E-08	1.016E-09	4.908E-12	2.371E-14
Ce-144	0.000E+00	0.000E+00	3.995E-05	3.146E-04	5.669E-04	4.467E-04	2.318E-04	1.190E-04	1.624E-05	4.610E-07	1.389E-07	1.012E-07	7.380E-08
Cm-242	0.000E+00	0.000E+00	7.032E-07	5.536E-06	9.974E-06	7.857E-06	4.074E-06	2.091E-06	2.847E-07	8.055E-09	2.400E-09	1.718E-09	1.230E-09
Cm-244	0.000E+00	0.000E+00	4.122E-08	3.245E-07	5.850E-07	4.611E-07	2.394E-07	1.231E-07	1.683E-08	4.800E-10	1.466E-10	1.094E-10	8.164E-11
Co-58	0.000E+00	0.000E+00	7.829E-07	6.162E-06	1.110E-05	8.733E-06	4.520E-06	2.316E-06	3.136E-07	8.775E-09	2.529E-09	1.713E-09	1.160E-09
Co-60	0.000E+00	0.000E+00	4.214E-07	3.318E-06	5.981E-06	4.714E-06	2.448E-06	1.258E-06	1.720E-07	4.903E-09	1.495E-09	1.113E-09	8.284E-10
Cs-134	2.082E-04	1.731E-03	6.967E-03	2.754E-02	4.435E-02	3.462E-02	1.795E-02	9.225E-03	1.260E-03	3.566E-05	1.071E-05	7.929E-06	5.869E-06
Cs-136	6.646E-05	5.522E-04	2.220E-03	8.757E-03	1.404E-02	1.086E-02	5.537E-03	2.796E-03	3.626E-04	9.247E-06	2.034E-06	8.950E-07	3.939E-07
Cs-137	1.567E-04	1.303E-03	5.243E-03	2.073E-02	3.338E-02	2.606E-02	1.352E-02	6.949E-03	9.500E-04	2.693E-05	8.133E-06	6.071E-06	4.532E-06
I-131	9.847E-04	8.224E-03	3.606E-02	1.543E-01	2.674E-01	2.513E-01	2.053E-01	1.789E-01	9.784E-02	7.196E-02	3.957E-02	1.480E-02	5.600E-03
I-132	1.383E-03	1.082E-02	4.434E-02	1.673E-01	1.952E-01	8.811E-02	2.878E-02	1.370E-02	2.641E-03	8.526E-04	1.961E-04	1.746E-05	1.554E-06
I-133	2.037E-03	1.685E-02	7.277E-02	3.021E-01	4.933E-01	4.115E-01	2.650E-01	1.820E-01	4.874E-02	8.599E-03	6.535E-05	1.946E-08	5.865E-12
I-134	1.981E-03	1.273E-02	3.765E-02	7.331E-02	2.632E-02	1.061E-03	1.597E-06	2.564E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I-135	1.911E-03	1.543E-02	6.430E-02	2.486E-01	3.517E-01	2.204E-01	8.006E-02	3.102E-02	1.492E-03	8.495E-06	2.168E-12	0.000E+00	0.000E+00
Kr-85	1.398E-05	1.261E-04	1.171E-03	7.835E-03	2.549E-02	5.305E-02	8.679E-02	1.039E-01	6.656E-02	6.025E-02	5.835E-02	5.547E-02	5.272E-02
Kr-85m	2.469E-04	2.115E-03	1.818E-02	1.042E-01	2.487E-01	2.788E-01	1.323E-01	4.594E-02	7.180E-04	3.870E-07	0.000E+00	0.000E+00	0.000E+00
Kr-87	4.627E-04	3.479E-03	2.461E-02	9.545E-02	1.044E-01	2.455E-02	5.130E-04	7.845E-06	1.047E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Kr-88	6.767E-04	5.626E-03	4.626E-02	2.424E-01	4.840E-01	3.795E-01	8.810E-02	1.497E-02	2.742E-05	2.028E-10	0.000E+00	0.000E+00	0.000E+00
La-140	0.000E+00	0.000E+00	3.527E-05	4.529E-04	1.705E-03	2.773E-03	2.766E-03	2.006E-03	4.471E-04	1.713E-05	4.834E-06	2.154E-06	9.348E-07
La-141	0.000E+00	0.000E+00	1.576E-05	1.040E-04	1.318E-04	5.129E-05	6.496E-06	8.145E-07	1.616E-09	9.706E-15	0.000E+00	0.000E+00	0.000E+00
La-142	0.000E+00	0.000E+00	1.174E-05	5.899E-05	4.327E-05	5.646E-06	8.036E-08	1.132E-09	3.154E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Mo-99	0.000E+00	0.000E+00	2.641E-04	2.058E-03	3.633E-03	2.746E-03	1.311E-03	6.195E-04	6.584E-05	1.135E-06	7.644E-08	4.592E-09	2.758E-10
Nb-95	0.000E+00	0.000E+00	2.029E-05	1.598E-04	2.879E-04	2.270E-04	1.178E-04	6.057E-05	8.278E-06	2.358E-07	7.144E-08	5.193E-08	3.729E-08
Nd-147	0.000E+00	0.000E+00	7.652E-06	6.009E-05	1.077E-04	8.404E-05	4.273E-05	2.151E-05	2.761E-06	6.944E-08	1.453E-08	5.774E-09	2.294E-09
Np-239	0.000E+00	0.000E+00	5.537E-04	4.306E-03	7.574E-03	5.685E-03	2.676E-03	1.247E-03	1.270E-04	2.012E-06	1.052E-07	4.140E-09	1.629E-10
Pr-143	0.000E+00	0.000E+00	1.703E-05	1.344E-04	2.435E-04	1.940E-04	1.024E-04	5.322E-05	7.340E-06	2.005E-07	4.671E-08	2.098E-08	9.400E-09
Pu-238	0.000E+00	0.000E+00	1.204E-07	9.481E-07	1.709E-06	1.347E-06	6.995E-07	3.596E-07	4.918E-08	1.403E-09	4.292E-10	3.209E-10	2.400E-10
Pu-239	0.000E+00	0.000E+00	1.279E-08	1.007E-07	1.816E-07	1.432E-07	7.444E-08	3.830E-08	5.249E-09	1.502E-10	4.604E-11	3.441E-11	2.571E-11
Pu-240	0.000E+00	0.000E+00	2.057E-08	1.619E-07	2.919E-07	2.301E-07	1.195E-07	6.142E-08	8.398E-09	2.396E-10	7.324E-11	5.471E-11	4.087E-11
Pu-241	0.000E+00	0.000E+00	5.072E-06	3.994E-05	7.199E-05	5.674E-05	2.946E-05	1.515E-05	2.071E-06	5.906E-08	1.804E-08	1.346E-08	1.004E-08
Rb-86	1.965E-06	1.633E-05	6.566E-05	2.592E-04	4.161E-04	3.228E-04	1.654E-04	8.398E-05	1.106E-05	2.911E-07	7.039E-08	3.626E-08	1.868E-08
Rh-105	0.000E+00	0.000E+00	1.465E-04	1.150E-03	2.047E-03	1.545E-03	7.072E-04	3.139E-04	2.695E-05	3.002E-07	5.453E-09	3.688E-11	2.494E-13
Ru-103	0.000E+00	0.000E+00	2.273E-04	1.789E-03	3.219E-03	2.530E-03	1.306E-03	6.675E-04	8.968E-05	2.470E-06	6.791E-07	4.252E-07	2.662E-07
Ru-105	0.000E+00	0.000E+00	1.345E-04	9.057E-04	1.195E-03	5.043E-04	7.511E-05	1.107E-05	3.573E-08	5.675E-13	0.000E+00	0.000E+00	0.000E+00
Ru-106	0.000E+00	0.000E+00	9.057E-05	7.131E-04	1.285E-03	1.013E-03	5.255E-04	2.700E-04	3.685E-05	1.047E-06	3.165E-07	2.320E-07	1.701E-07
Sb-127	0.000E+00	0.000E+00	2.464E-04	1.926E-03	3.420E-03	2.616E-03	1.279E-03	6.193E-04	7.073E-05	1.408E-06	1.461E-07	1.803E-08	2.226E-09
Sb-129	0.000E+00	0.000E+00	7.815E-04	5.241E-03	6.854E-03	2.843E-03	4.090E-04	5.826E-05	1.694E-07	2.185E-12	0.000E+00	0.000E+00	0.000E+00

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TABLE 8. DBA-LOCA REACTOR BUILDING AIRBORNE ACTIVITY CONCENTRATION

DBA-LOCA REACTOR BUILDING AIRBORNE ACTIVITY CONCENTRATION (μCi/cc)

Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Sr-89	0.000E+00	0.000E+00	1.086E-03	8.549E-03	1.539E-02	1.210E-02	6.256E-03	3.202E-03	4.318E-04	1.199E-05	3.374E-06	2.197E-06	1.431E-06
Sr-90	0.000E+00	0.000E+00	1.385E-04	1.091E-03	1.966E-03	1.550E-03	8.047E-04	4.137E-04	5.656E-05	1.614E-06	4.930E-07	3.680E-07	2.747E-07
Sr-91	0.000E+00	0.000E+00	1.288E-03	9.427E-03	1.468E-02	8.645E-03	2.504E-03	7.181E-04	1.704E-05	1.465E-08	1.225E-13	0.000E+00	0.000E+00
Sr-92	0.000E+00	0.000E+00	1.139E-03	6.942E-03	7.503E-03	2.126E-03	1.427E-04	9.477E-06	2.796E-09	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Tc-99m	0.000E+00	0.000E+00	2.364E-04	1.858E-03	3.328E-03	2.570E-03	1.274E-03	6.208E-04	6.738E-05	1.163E-06	7.837E-08	4.708E-09	2.828E-10
Te-127	0.000E+00	0.000E+00	2.461E-04	1.936E-03	3.480E-03	2.718E-03	1.380E-03	6.914E-04	8.386E-05	1.827E-06	2.859E-07	1.212E-07	7.518E-08
Te-127m	0.000E+00	0.000E+00	4.198E-05	3.306E-04	5.959E-04	4.697E-04	2.439E-04	1.254E-04	1.712E-05	4.862E-07	1.448E-07	1.021E-07	7.161E-08
Te-129	0.000E+00	0.000E+00	8.310E-04	6.030E-03	8.786E-03	4.376E-03	1.388E-03	5.292E-04	6.018E-05	1.641E-06	4.432E-07	2.694E-07	1.637E-07
Te-129m	0.000E+00	0.000E+00	1.758E-04	1.384E-03	2.494E-03	1.962E-03	1.013E-03	5.174E-04	6.932E-05	1.898E-06	5.126E-07	3.115E-07	1.893E-07
Te-131m	0.000E+00	0.000E+00	5.550E-04	4.270E-03	7.349E-03	5.282E-03	2.280E-03	9.741E-04	7.651E-05	7.201E-07	7.901E-09	2.305E-11	6.727E-14
Te-132	0.000E+00	0.000E+00	4.035E-03	3.149E-02	5.576E-02	4.242E-02	2.052E-02	9.826E-03	1.086E-03	2.025E-05	1.727E-06	1.537E-07	1.368E-08
Xe-133	2.005E-03	1.812E-02	1.681E-01	1.122E+00	3.634E+00	7.475E+00	1.193E+01	1.392E+01	8.761E+00	6.617E+00	2.884E+00	6.985E-01	1.706E-01
Xe-135	6.937E-04	6.825E-03	6.359E-02	4.330E-01	1.412E+00	2.678E+00	3.220E+00	2.628E+00	6.397E-01	2.168E-02	3.469E-07	3.026E-15	0.000E+00
Y-90	0.000E+00	0.000E+00	1.994E-06	2.314E-05	7.985E-05	1.258E-04	1.269E-04	9.432E-05	2.296E-05	1.047E-06	4.588E-07	3.680E-07	2.762E-07
Y-91	0.000E+00	0.000E+00	1.425E-05	1.134E-04	2.102E-04	1.737E-04	9.544E-05	5.048E-05	7.051E-06	1.977E-07	5.627E-08	3.734E-08	2.478E-08
Y-92	0.000E+00	0.000E+00	9.936E-05	1.540E-03	4.764E-03	3.609E-03	6.899E-04	9.512E-05	1.509E-07	3.787E-13	0.000E+00	0.000E+00	0.000E+00
Y-93	0.000E+00	0.000E+00	1.055E-05	7.753E-05	1.218E-04	7.298E-05	2.188E-05	6.497E-06	1.711E-07	1.811E-10	2.827E-15	0.000E+00	0.000E+00
Zr-95	0.000E+00	0.000E+00	2.028E-05	1.596E-04	2.874E-04	2.262E-04	1.170E-04	5.993E-05	8.107E-06	2.264E-07	6.483E-08	4.346E-08	2.913E-08
Zr-97	0.000E+00	0.000E+00	1.927E-05	1.456E-04	2.418E-04	1.618E-04	6.050E-05	2.240E-05	1.145E-06	4.561E-09	3.796E-12	1.505E-16	0.000E+00
SUM	**1.283E-02**	**1.039E-01**	**6.075E-01**	**3.125E+00**	**7.528E+00**	**1.207E+01**	**1.614E+01**	**1.716E+01**	**9.625E+00**	**6.781E+00**	**2.982E+00**	**7.688E-01**	**2.289E-01**

Note:
Reactor Building Airborne Activity Concentration (μCi/cc) = (Corresponding Table 3 Activity Ci x 1000000 μCi/Ci) / (4156600 / 2 ft3 x 28316.85 cc/ ft3)

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TABLE 9. DBA-LOCA TURBINE BUILDING AIRBORNE ACTIVITY CONCENTRATION

DBA-LOCA TURBINE BUILDING AIRBORNE ACTIVITY CONCENTRATION (µCi/cc)													
Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Am-241	0.000E+00	0.000E+00	3.227E-11	2.616E-10	5.295E-10	5.714E-10	5.762E-10	5.778E-10	5.825E-10	5.918E-10	6.197E-10	6.661E-10	7.123E-10
Ba-139	0.000E+00	0.000E+00	1.499E-05	7.348E-05	5.436E-05	7.836E-06	1.410E-07	2.524E-09	1.447E-14	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Ba-140	0.000E+00	0.000E+00	2.483E-05	2.008E-04	4.043E-04	4.317E-04	4.264E-04	4.188E-04	3.965E-04	3.555E-04	2.563E-04	1.485E-04	8.608E-05
Ce-141	0.000E+00	0.000E+00	5.709E-07	4.625E-06	9.342E-06	1.004E-05	1.002E-05	9.955E-06	9.744E-06	9.335E-06	8.206E-06	6.621E-06	5.341E-06
Ce-143	0.000E+00	0.000E+00	5.190E-07	4.119E-06	7.989E-06	7.915E-06	6.729E-06	5.688E-06	3.435E-06	1.253E-06	6.082E-08	3.927E-10	2.536E-12
Ce-144	0.000E+00	0.000E+00	4.801E-07	3.891E-06	7.867E-06	8.474E-06	8.516E-06	8.509E-06	8.487E-06	8.443E-06	8.313E-06	8.102E-06	7.895E-06
Cm-242	0.000E+00	0.000E+00	8.449E-09	6.846E-08	1.384E-07	1.491E-07	1.497E-07	1.495E-07	1.488E-07	1.475E-07	1.437E-07	1.375E-07	1.316E-07
Cm-244	0.000E+00	0.000E+00	4.952E-10	4.014E-09	8.118E-09	8.747E-09	8.797E-09	8.797E-09	8.795E-09	8.791E-09	8.777E-09	8.756E-09	8.734E-09
Co-58	0.000E+00	0.000E+00	9.407E-09	7.621E-08	1.540E-07	1.657E-07	1.661E-07	1.656E-07	1.639E-07	1.607E-07	1.514E-07	1.371E-07	1.241E-07
Co-60	0.000E+00	0.000E+00	5.064E-09	4.104E-08	8.300E-08	8.943E-08	8.994E-08	8.993E-08	8.988E-08	8.979E-08	8.952E-08	8.907E-08	8.862E-08
Cs-134	2.515E-06	2.087E-05	8.498E-05	3.452E-04	6.247E-04	6.701E-04	6.789E-04	6.842E-04	6.914E-04	7.047E-04	7.374E-04	7.733E-04	7.933E-04
Cs-136	8.026E-07	6.656E-06	2.708E-05	1.098E-04	1.977E-04	2.103E-04	2.094E-04	2.074E-04	1.990E-04	1.828E-04	1.400E-04	8.729E-05	5.324E-05
Cs-137	1.893E-06	1.571E-05	6.396E-05	2.599E-04	4.703E-04	5.045E-04	5.113E-04	5.154E-04	5.212E-04	5.322E-04	5.598E-04	5.921E-04	6.126E-04
I-131	1.172E-05	9.759E-05	4.322E-04	1.896E-03	3.633E-03	4.363E-03	5.410E-03	6.462E-03	7.725E-03	9.912E-03	1.357E-02	1.268E-02	8.743E-03
I-132	1.645E-05	1.283E-04	5.308E-04	2.051E-03	2.643E-03	1.554E-03	9.468E-04	8.452E-04	6.776E-04	4.427E-04	1.234E-04	1.469E-05	1.747E-06
I-133	2.425E-05	1.999E-04	8.721E-04	3.714E-03	6.701E-03	7.144E-03	6.981E-03	6.572E-03	3.848E-03	1.185E-03	2.244E-05	1.669E-08	9.168E-12
I-134	2.358E-05	1.510E-04	4.512E-04	9.010E-04	3.575E-04	1.843E-05	4.209E-08	9.261E-11	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
I-135	2.274E-05	1.831E-04	7.706E-04	3.055E-03	4.778E-03	3.826E-03	2.109E-03	1.120E-03	1.178E-04	1.171E-06	7.445E-13	0.000E+00	0.000E+00
Kr-85	3.829E-07	3.855E-06	2.534E-05	1.518E-04	6.011E-04	2.000E-03	6.770E-03	1.409E-02	2.966E-02	7.619E-02	3.199E-01	9.696E-01	1.788E+00
Kr-85m	6.762E-06	6.466E-05	3.933E-04	2.019E-03	5.866E-03	1.051E-02	1.032E-02	6.230E-03	3.199E-04	4.894E-07	4.123E-16	0.000E+00	0.000E+00
Kr-87	1.267E-05	1.064E-04	5.324E-04	1.849E-03	2.462E-03	9.255E-04	4.001E-05	1.064E-06	4.664E-12	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Kr-88	1.853E-05	1.720E-04	1.001E-03	4.697E-03	1.141E-02	1.430E-02	6.873E-03	2.030E-03	1.221E-05	2.564E-10	0.000E+00	0.000E+00	0.000E+00
La-140	0.000E+00	0.000E+00	4.241E-07	5.621E-06	2.373E-05	5.268E-05	1.017E-04	1.435E-04	2.337E-04	3.137E-04	2.894E-04	1.724E-04	9.999E-05
La-141	0.000E+00	0.000E+00	1.893E-07	1.286E-06	1.829E-06	9.730E-07	2.387E-07	5.822E-08	8.446E-10	1.777E-13	0.000E+00	0.000E+00	0.000E+00
La-142	0.000E+00	0.000E+00	1.411E-07	7.296E-07	6.004E-07	1.071E-07	2.953E-09	8.094E-11	1.666E-15	0.000E+00	0.000E+00	0.000E+00	0.000E+00
Mo-99	0.000E+00	0.000E+00	3.174E-06	2.545E-05	5.041E-05	5.209E-05	4.816E-05	4.428E-05	3.441E-05	2.078E-05	4.576E-06	3.675E-07	2.951E-08
Nb-95	0.000E+00	0.000E+00	2.438E-07	1.976E-06	3.996E-06	4.306E-06	4.330E-06	4.329E-06	4.327E-06	4.319E-06	4.276E-06	4.156E-06	3.989E-06
Nd-147	0.000E+00	0.000E+00	9.194E-08	7.432E-07	1.495E-06	1.594E-06	1.570E-06	1.538E-06	1.443E-06	1.272E-06	8.700E-07	4.621E-07	2.454E-07
Np-239	0.000E+00	0.000E+00	6.653E-06	5.326E-05	1.051E-04	1.078E-04	9.832E-05	8.913E-05	6.640E-05	3.685E-05	6.296E-06	3.313E-07	1.743E-08
Pr-143	0.000E+00	0.000E+00	2.046E-07	1.662E-06	3.380E-06	3.681E-06	3.763E-06	3.804E-06	3.837E-06	3.672E-06	2.797E-06	1.679E-06	1.006E-06
Pu-238	0.000E+00	0.000E+00	1.447E-09	1.173E-08	2.372E-08	2.556E-08	2.570E-08	2.571E-08	2.570E-08	2.570E-08	2.570E-08	2.568E-08	2.567E-08
Pu-239	0.000E+00	0.000E+00	1.537E-10	1.246E-09	2.520E-09	2.717E-09	2.735E-09	2.738E-09	2.743E-09	2.750E-09	2.756E-09	2.754E-09	2.750E-09
Pu-240	0.000E+00	0.000E+00	2.471E-10	2.003E-09	4.051E-09	4.365E-09	4.390E-09	4.390E-09	4.389E-09	4.388E-09	4.384E-09	4.378E-09	4.372E-09
Pu-241	0.000E+00	0.000E+00	6.094E-08	4.939E-07	9.991E-07	1.076E-06	1.083E-06	1.083E-06	1.082E-06	1.082E-06	1.080E-06	1.077E-06	1.074E-06
Rb-86	2.373E-08	1.968E-07	8.011E-07	3.251E-06	5.876E-06	6.328E-06	6.561E-06	6.817E-06	7.089E-06	7.587E-06	8.408E-06	7.879E-06	6.381E-06
Rh-105	0.000E+00	0.000E+00	1.760E-06	1.422E-05	2.841E-05	2.931E-05	2.598E-05	2.244E-05	1.409E-05	5.497E-06	3.264E-07	2.951E-09	2.668E-11
Ru-103	0.000E+00	0.000E+00	2.732E-06	2.212E-05	4.468E-05	4.800E-05	4.799E-05	4.771E-05	4.687E-05	4.523E-05	4.065E-05	3.403E-05	2.848E-05
Ru-105	0.000E+00	0.000E+00	1.616E-06	1.120E-05	1.658E-05	9.568E-06	2.760E-06	7.916E-07	1.867E-08	1.039E-11	0.000E+00	0.000E+00	0.000E+00
Ru-106	0.000E+00	0.000E+00	1.088E-06	8.819E-06	1.783E-05	1.921E-05	1.931E-05	1.930E-05	1.926E-05	1.918E-05	1.895E-05	1.857E-05	1.820E-05
Sb-127	0.000E+00	0.000E+00	2.961E-06	2.382E-05	4.746E-05	4.963E-05	4.700E-05	4.427E-05	3.697E-05	2.578E-05	8.746E-06	1.443E-06	2.381E-07
Sb-129	0.000E+00	0.000E+00	9.389E-06	6.482E-05	9.511E-05	5.394E-05	1.503E-05	4.164E-06	8.853E-08	4.001E-11	0.000E+00	0.000E+00	0.000E+00

TABLE 9. DBA-LOCA TURBINE BUILDING AIRBORNE ACTIVITY CONCENTRATION

DBA-LOCA TURBINE BUILDING AIRBORNE ACTIVITY CONCENTRATION (μCi/cc)

Isotope	Time Post-Accident												
	.1667 hr	0.5 hr	1 hr	2 hr	4 hr	8 hr	16 hr	24 hr	48 hr	96 hr	240 hr	480 hr	720 hr
Sr-89	0.000E+00	0.000E+00	1.305E-05	1.057E-04	2.136E-04	2.296E-04	2.299E-04	2.288E-04	2.257E-04	2.195E-04	2.020E-04	1.758E-04	1.531E-04
Sr-90	0.000E+00	0.000E+00	1.664E-06	1.349E-05	2.728E-05	2.940E-05	2.957E-05	2.957E-05	2.956E-05	2.955E-05	2.951E-05	2.945E-05	2.939E-05
Sr-91	0.000E+00	0.000E+00	1.547E-05	1.166E-04	2.038E-04	1.640E-04	9.201E-05	5.133E-05	8.908E-06	2.683E-07	7.334E-12	0.000E+00	0.000E+00
Sr-92	0.000E+00	0.000E+00	1.368E-05	8.586E-05	1.041E-04	4.033E-05	5.242E-06	6.774E-07	1.462E-09	6.805E-15	0.000E+00	0.000E+00	0.000E+00
Tc-99m	0.000E+00	0.000E+00	2.840E-06	2.298E-05	4.619E-05	4.875E-05	4.681E-05	4.438E-05	3.522E-05	2.131E-05	4.692E-06	3.767E-07	3.025E-08
Te-127	0.000E+00	0.000E+00	2.956E-06	2.394E-05	4.830E-05	5.157E-05	5.072E-05	4.942E-05	4.383E-05	3.346E-05	1.712E-05	9.699E-06	8.042E-06
Te-127m	0.000E+00	0.000E+00	5.045E-07	4.089E-06	8.270E-06	8.911E-06	8.962E-06	8.960E-06	8.949E-06	8.904E-06	8.669E-06	8.167E-06	7.660E-06
Te-129	0.000E+00	0.000E+00	9.984E-06	7.457E-05	1.219E-04	8.302E-05	5.099E-05	3.783E-05	3.145E-05	3.005E-05	2.653E-05	2.156E-05	1.751E-05
Te-129m	0.000E+00	0.000E+00	2.113E-06	1.712E-05	3.461E-05	3.723E-05	3.723E-05	3.699E-05	3.623E-05	3.476E-05	3.068E-05	2.493E-05	2.025E-05
Te-131m	0.000E+00	0.000E+00	6.668E-06	5.281E-05	1.020E-04	1.002E-04	8.377E-05	6.963E-05	3.999E-05	1.319E-05	4.730E-07	1.845E-09	7.196E-12
Te-132	0.000E+00	0.000E+00	4.848E-05	3.894E-04	7.738E-04	8.048E-04	7.540E-04	7.024E-04	5.677E-04	3.709E-04	1.034E-04	1.230E-05	1.464E-06
Xe-133	5.485E-05	5.518E-04	3.622E-03	2.162E-02	8.480E-02	2.759E-01	8.934E-01	1.779E+00	3.282E+00	6.477E+00	1.232E+01	9.973E+00	4.914E+00
Xe-135	1.821E-05	1.838E-04	1.220E-03	7.230E-03	2.553E-02	6.245E-02	1.135E-01	1.277E-01	4.332E-02	2.878E-03	2.050E-07	6.969E-15	0.000E+00
Y-90	0.000E+00	0.000E+00	2.396E-08	2.870E-07	1.111E-06	2.391E-06	4.665E-06	6.745E-06	1.200E-05	1.918E-05	2.747E-05	2.945E-05	2.954E-05
Y-91	0.000E+00	0.000E+00	1.712E-07	1.403E-06	2.918E-06	3.295E-06	3.508E-06	3.609E-06	3.686E-06	3.623E-06	3.372E-06	2.991E-06	2.653E-06
Y-92	0.000E+00	0.000E+00	1.196E-06	1.915E-05	6.636E-05	6.860E-05	2.538E-05	6.805E-06	7.891E-08	6.947E-12	0.000E+00	0.000E+00	0.000E+00
Y-93	0.000E+00	0.000E+00	1.267E-07	9.589E-07	1.691E-06	1.384E-06	8.041E-07	4.644E-07	8.943E-08	3.317E-09	1.692E-13	0.000E+00	0.000E+00
Zr-95	0.000E+00	0.000E+00	2.437E-07	1.974E-06	3.989E-06	4.290E-06	4.299E-06	4.284E-06	4.237E-06	4.145E-06	3.881E-06	3.478E-06	3.116E-06
Zr-97	0.000E+00	0.000E+00	2.315E-07	1.801E-06	3.356E-06	3.069E-06	2.223E-06	1.601E-06	5.983E-07	8.352E-08	2.272E-10	1.205E-14	0.000E+00
SUM	**2.154E-04**	**1.886E-03**	**1.022E-02**	**5.136E-02**	**1.528E-01**	**3.870E-01**	**1.050E+00**	**1.948E+00**	**3.371E+00**	**6.571E+00**	**1.265E+01**	**1.096E+01**	**6.713E+00**

Note:
Turbine Building Airborne Activity Concentration (μCi/cc) = (Corresponding Table 4 Activity Ci x 1000000 μCi/Ci) / (4000000 ft3 x 28316.85 cc/ ft3)

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Table 10. Containment Direct Shine - Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	3.998E-05	1.000E+00	3.998E-05	-1.792E+00	-1.013E+01					
5.000E-01	1.009E-04	1.000E+00	1.009E-04	-6.931E-01	-9.201E+00	-8.617E+00	8.428E-01	2.376E-08	1.000E+00	2.376E-08
1.000E+00	5.668E-04	1.000E+00	5.668E-04	0.000E+00	-7.476E+00	-7.476E+00	2.490E+00	1.480E-07	1.000E+00	1.480E-07
2.000E+00	9.347E-04	1.000E+00	9.347E-04	6.931E-01	-6.975E+00	-7.476E+00	7.217E-01	7.566E-07	1.000E+00	7.566E-07
4.000E+00	3.527E-04	1.000E+00	3.527E-04	1.386E+00	-7.950E+00	-6.001E+00	-1.406E+00	1.129E-06	1.000E+00	1.129E-06
8.000E+00	6.409E-05	1.000E+00	6.409E-05	2.079E+00	-9.655E+00	-4.539E+00	-2.460E+00	6.150E-07	1.000E+00	6.150E-07
1.600E+01	5.319E-06	1.000E+00	5.319E-06	2.773E+00	-1.214E+01	-2.188E+00	-3.591E+00	1.650E-07	1.000E+00	1.650E-07
2.400E+01	7.338E-07	1.000E+00	7.338E-07	3.178E+00	-1.413E+01	1.401E+00	-4.885E+00	1.737E-08	1.000E+00	1.737E-08
4.800E+01	5.591E-09	1.000E+00	5.591E-09	3.871E+00	-1.900E+01	8.236E+00	-7.036E+00	2.873E-09	6.000E-01	1.724E-09
9.600E+01	6.980E-11	1.000E+00	6.980E-11	4.564E+00	-2.339E+01	5.478E+00	-6.324E+00	4.915E-11	6.000E-01	2.949E-11
2.400E+02	3.823E-13	1.000E+00	3.823E-13	5.481E+00	-2.859E+01	2.553E+00	-5.683E+00	1.411E-12	4.000E-01	5.645E-13
4.800E+02	5.141E-16	1.000E+00	5.141E-16	6.174E+00	-3.520E+01	2.368E+01	-9.538E+00	1.072E-14	4.000E-01	4.287E-15
7.200E+02	1.579E-16	1.000E+00	1.579E-16	6.579E+00	-3.638E+01	-1.723E+01	-2.911E+00	6.963E-17	4.000E-01	2.785E-17
							Total	2.858E-06		2.857E-06

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Table 11. Reactor Building Direct Shine - Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; Reactor Building Zone I and III Isolation

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	1.524E-02	1.364E+00	2.079E-02	-1.792E+00	-3.873E+00					
5.000E-01	1.182E-01	1.364E+00	1.612E-01	-6.931E-01	-1.825E+00	-5.323E-01	1.865E+00	2.693E-05	1.000E+00	2.693E-05
1.000E+00	6.846E-01	1.364E+00	9.338E-01	0.000E+00	-6.850E-02	-6.850E-02	2.534E+00	2.414E-04	1.000E+00	2.414E-04
2.000E+00	2.958E+00	1.250E+00	3.698E+00	6.931E-01	1.308E+00	-6.850E-02	1.985E+00	2.164E-03	1.000E+00	2.164E-03
4.000E+00	4.718E+00	1.150E+00	5.426E+00	1.386E+00	1.691E+00	9.242E-01	5.533E-01	9.211E-03	1.000E+00	9.211E-03
8.000E+00	3.110E+00	1.065E+00	3.312E+00	2.079E+00	1.198E+00	2.678E+00	-7.120E-01	1.665E-02	1.000E+00	1.665E-02
1.600E+01	7.817E-01	1.020E+00	7.973E-01	2.773E+00	-2.265E-01	5.470E+00	-2.055E+00	1.303E-02	1.000E+00	1.303E-02
2.400E+01	1.968E-01	1.008E+00	1.984E-01	3.178E+00	-1.618E+00	9.286E+00	-3.431E+00	3.289E-03	1.000E+00	3.289E-03
4.800E+01	1.147E-02	1.000E+00	1.147E-02	3.871E+00	-4.468E+00	1.145E+01	-4.112E+00	1.353E-03	6.000E-01	8.117E-04
9.600E+01	1.533E-03	1.000E+00	1.533E-03	4.564E+00	-6.481E+00	6.772E+00	-2.903E+00	2.119E-04	6.000E-01	1.272E-04
2.400E+02	4.459E-04	1.000E+00	4.459E-04	5.481E+00	-7.715E+00	-3.291E-01	-1.348E+00	1.155E-04	4.000E-01	4.619E-05
4.800E+02	6.154E-05	1.000E+00	6.154E-05	6.174E+00	-9.696E+00	7.943E+00	-2.857E+00	4.172E-05	4.000E-01	1.669E-05
7.200E+02	2.075E-05	1.000E+00	2.075E-05	6.579E+00	-1.078E+01	6.857E+00	-2.681E+00	8.684E-06	4.000E-01	3.473E-06
					Total (Zone I & III Isolation)			4.634E-02		4.562E-02

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Table 12. Reactor Building Direct Shine - Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; Reactor Building Zone I, II & III Isolation

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	8.398E-03	1.364E+00	1.654E-02	-1.792E+00	-4.102E+00					
5.000E-01	6.503E-02	1.364E+00	1.281E-01	-6.931E-01	-2.055E+00	-7.632E-01	1.863E+00	2.141E-05	1.000E+00	2.141E-05
1.000E+00	3.774E-01	1.364E+00	7.435E-01	0.000E+00	-2.964E-01	-2.964E-01	2.537E+00	1.921E-04	1.000E+00	1.921E-04
2.000E+00	1.631E+00	1.250E+00	2.945E+00	6.931E-01	1.080E+00	-2.964E-01	1.986E+00	1.724E-03	1.000E+00	1.724E-03
4.000E+00	2.600E+00	1.150E+00	4.319E+00	1.386E+00	1.463E+00	6.971E-01	5.525E-01	7.334E-03	1.000E+00	7.334E-03
8.000E+00	1.712E+00	1.065E+00	2.633E+00	2.079E+00	9.683E-01	2.452E+00	-7.136E-01	1.325E-02	1.000E+00	1.325E-02
1.600E+01	4.298E-01	1.020E+00	6.332E-01	2.773E+00	-4.570E-01	5.244E+00	-2.056E+00	1.035E-02	1.000E+00	1.035E-02
2.400E+01	1.080E-01	1.008E+00	1.572E-01	3.178E+00	-1.850E+00	9.069E+00	-3.436E+00	2.610E-03	1.000E+00	2.610E-03
4.800E+01	6.262E-03	1.000E+00	9.045E-03	3.871E+00	-4.706E+00	1.124E+01	-4.120E+00	1.070E-03	6.000E-01	6.423E-04
9.600E+01	8.330E-04	1.000E+00	1.203E-03	4.564E+00	-6.723E+00	6.561E+00	-2.910E+00	1.668E-04	6.000E-01	1.001E-04
2.400E+02	2.429E-04	1.000E+00	3.508E-04	5.481E+00	-7.955E+00	-5.839E-01	-1.345E+00	9.074E-05	4.000E-01	3.630E-05
4.800E+02	3.308E-05	1.000E+00	4.778E-05	6.174E+00	-9.949E+00	7.809E+00	-2.876E+00	3.265E-05	4.000E-01	1.306E-05
7.200E+02	1.112E-05	1.000E+00	1.606E-05	6.579E+00	-1.104E+01	6.651E+00	-2.689E+00	6.733E-06	4.000E-01	2.693E-06
						Total		3.685E-02		3.627E-02

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Table 13. Turbine Building Direct Shine - Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; 2.5 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	2.467E-03	1.364E+00	3.365E-03	-1.792E+00	-5.694E+00					
5.000E-01	2.072E-02	1.364E+00	2.826E-02	-6.931E-01	-3.566E+00	-2.223E+00	1.937E+00	4.620E-06	1.000E+00	4.620E-06
1.000E+00	1.033E-01	1.364E+00	1.409E-01	0.000E+00	-1.960E+00	-1.960E+00	2.318E+00	3.821E-05	1.000E+00	3.821E-05
2.000E+00	4.250E-01	1.250E+00	5.313E-01	6.931E-01	-6.325E-01	-1.960E+00	1.915E+00	3.162E-04	1.000E+00	3.162E-04
4.000E+00	8.359E-01	1.150E+00	9.613E-01	1.386E+00	-3.948E-02	-1.226E+00	8.556E-01	1.500E-03	1.000E+00	1.500E-03
8.000E+00	8.796E-01	1.065E+00	9.368E-01	2.079E+00	-6.531E-02	1.217E-02	-3.726E-02	3.790E-03	1.000E+00	3.790E-03
1.600E+01	4.193E-01	1.020E+00	4.277E-01	2.773E+00	-8.494E-01	2.287E+00	-1.131E+00	4.965E-03	1.000E+00	4.965E-03
2.400E+01	1.495E-01	1.008E+00	1.507E-01	3.178E+00	-1.892E+00	6.284E+00	-2.573E+00	2.051E-03	1.000E+00	2.051E-03
4.800E+01	2.339E-02	1.000E+00	2.339E-02	3.871E+00	-3.755E+00	6.649E+00	-2.688E+00	1.478E-03	6.000E-01	8.867E-04
9.600E+01	1.841E-02	1.000E+00	1.841E-02	4.564E+00	-3.995E+00	-2.418E+00	-3.454E-01	9.848E-04	6.000E-01	5.909E-04
2.400E+02	1.408E-02	1.000E+00	1.408E-02	5.481E+00	-4.263E+00	-2.659E+00	-2.926E-01	2.279E-03	4.000E-01	9.115E-04
4.800E+02	9.276E-03	1.000E+00	9.276E-03	6.174E+00	-4.680E+00	-9.633E-01	-6.021E-01	2.697E-03	4.000E-01	1.079E-03
7.200E+02	6.716E-03	1.000E+00	6.716E-03	6.579E+00	-5.003E+00	2.369E-01	-7.965E-01	1.882E-03	4.000E-01	7.528E-04
						Total		2.199E-02		1.689E-02

For Information Only

Table 14. Turbine Building Direct Shine - Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	5.212E-04	1.364E+00	7.109E-04	-1.792E+00	-7.249E+00					
5.000E-01	4.411E-03	1.364E+00	6.017E-03	-6.931E-01	-5.113E+00	-3.765E+00	1.944E+00	9.815E-07	1.000E+00	9.815E-07
1.000E+00	2.228E-02	1.364E+00	3.039E-02	0.000E+00	-3.494E+00	-3.494E+00	2.337E+00	8.207E-06	1.000E+00	8.207E-06
2.000E+00	9.127E-02	1.250E+00	1.123E-01	6.931E-01	-2.187E+00	-3.494E+00	1.885E+00	6.729E-05	1.000E+00	6.729E-05
4.000E+00	1.784E-01	1.150E+00	1.998E-01	1.386E+00	-1.610E+00	-2.763E+00	8.317E-01	3.137E-04	1.000E+00	3.137E-04
8.000E+00	1.847E-01	1.065E+00	1.967E-01	2.079E+00	-1.626E+00	-1.579E+00	-2.258E-02	7.923E-04	1.000E+00	7.923E-04
1.600E+01	8.617E-02	1.020E+00	8.703E-02	2.773E+00	-2.441E+00	8.203E-01	-1.176E+00	1.027E-03	1.000E+00	1.027E-03
2.400E+01	2.964E-02	1.008E+00	2.988E-02	3.178E+00	-3.511E+00	4.870E+00	-2.637E+00	4.126E-04	1.000E+00	4.126E-04
4.800E+01	3.914E-03	1.000E+00	3.914E-03	3.871E+00	-5.543E+00	5.808E+00	-2.932E+00	2.739E-04	6.000E-01	1.643E-04
9.600E+01	3.202E-03	1.000E+00	3.202E-03	4.564E+00	-5.744E+00	-4.422E+00	-2.897E-01	1.683E-04	6.000E-01	1.010E-04
2.400E+02	2.464E-03	1.000E+00	2.464E-03	5.481E+00	-6.006E+00	-4.439E+00	-2.859E-01	3.977E-04	4.000E-01	1.591E-04
4.800E+02	1.511E-03	1.000E+00	1.511E-03	6.174E+00	-6.495E+00	-2.139E+00	-7.055E-01	4.547E-04	4.000E-01	1.819E-04
7.200E+02	9.898E-04	1.000E+00	9.898E-04	6.579E+00	-6.918E+00	-5.384E-02	-1.043E+00	2.915E-04	4.000E-01	1.166E-04
						Total		4.208E-03		3.345E-03

For Information Only

Table 15. SGTS Filter Shine to Elevation 783'-0" - Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	3.425E-03	2.303E+00	7.888E-03	-1.792E+00	-4.842E+00					
5.000E-01	2.270E-02	2.303E+00	5.228E-02	-6.931E-01	-2.951E+00	-1.758E+00	1.722E+00	9.120E-06	1.000E+00	9.120E-06
1.000E+00	1.483E-01	2.303E+00	3.415E-01	0.000E+00	-1.074E+00	-1.074E+00	2.708E+00	8.506E-05	1.000E+00	8.506E-05
2.000E+00	1.054E+00	2.303E+00	2.427E+00	6.931E-01	8.868E-01	-1.074E+00	2.829E+00	1.179E-03	1.000E+00	1.179E-03
4.000E+00	4.368E+00	2.303E+00	1.006E+01	1.386E+00	2.309E+00	-5.349E-01	2.051E+00	1.160E-02	1.000E+00	1.160E-02
8.000E+00	7.840E+00	2.303E+00	1.806E+01	2.079E+00	2.893E+00	1.139E+00	8.439E-01	5.651E-02	1.000E+00	5.651E-02
1.600E+01	1.068E+01	2.303E+00	2.460E+01	2.773E+00	3.203E+00	1.966E+00	4.460E-01	1.723E-01	1.000E+00	1.723E-01
2.400E+01	6.241E+00	2.303E+00	1.437E+01	3.178E+00	2.665E+00	6.876E+00	-1.325E+00	1.495E-01	1.000E+00	1.495E-01
4.800E+01	3.445E+00	1.000E+00	3.445E+00	3.871E+00	1.237E+00	9.215E+00	-2.061E+00	1.693E-01	6.000E-01	1.016E-01
9.600E+01	2.317E+00	1.000E+00	2.317E+00	4.564E+00	8.403E-01	3.452E+00	-5.722E-01	1.334E-01	6.000E-01	8.005E-02
2.400E+02	7.580E-01	1.000E+00	7.580E-01	5.481E+00	-2.771E-01	6.406E+00	-1.219E+00	1.846E-01	4.000E-01	7.385E-02
4.800E+02	1.131E-01	1.000E+00	1.131E-01	6.174E+00	-2.179E+00	1.477E+01	-2.745E+00	7.316E-02	4.000E-01	2.926E-02
7.200E+02	1.952E-02	1.000E+00	1.952E-02	6.579E+00	-3.936E+00	2.457E+01	-4.333E+00	1.207E-02	4.000E-01	4.829E-03
							Total	9.637E-01		6.807E-01

For Information Only

Table 16. 10"GBB-103 Shine To Computer Room Elevation 683'-0" - Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	1.905E-01	2.303E+00	4.387E-01	-1.792E+00	-8.239E-01					
5.000E-01	5.168E-01	2.303E+00	1.190E+00	-6.931E-01	1.741E-01	8.039E-01	9.086E-01	2.735E-04	1.000E+00	2.735E-04
1.000E+00	1.240E+00	2.303E+00	2.856E+00	0.000E+00	1.049E+00	1.049E+00	1.263E+00	9.991E-04	1.000E+00	9.991E-04
2.000E+00	2.289E+00	1.690E+00	3.868E+00	6.931E-01	1.353E+00	1.049E+00	4.379E-01	3.395E-03	1.000E+00	3.395E-03
4.000E+00	1.651E+00	1.320E+00	2.179E+00	1.386E+00	7.790E-01	1.927E+00	-8.279E-01	5.696E-03	1.000E+00	5.696E-03
8.000E+00	1.044E+00	1.113E+00	1.162E+00	2.079E+00	1.501E-01	2.037E+00	-9.073E-01	6.241E-03	1.000E+00	6.241E-03
1.600E+01	5.321E-01	1.050E+00	5.587E-01	2.773E+00	-5.821E-01	2.347E+00	-1.056E+00	6.319E-03	1.000E+00	6.319E-03
2.400E+01	3.357E-01	1.009E+00	3.387E-01	3.178E+00	-1.083E+00	2.840E+00	-1.234E+00	3.458E-03	1.000E+00	3.458E-03
4.800E+01	2.119E-01	1.000E+00	2.119E-01	3.871E+00	-1.552E+00	1.068E+00	-6.767E-01	6.316E-03	6.000E-01	3.790E-03
9.600E+01	2.025E-01	1.000E+00	2.025E-01	4.564E+00	-1.597E+00	-1.298E+00	-6.546E-02	9.918E-03	6.000E-01	5.951E-03
2.400E+02	1.369E-01	1.000E+00	1.369E-01	5.481E+00	-1.989E+00	3.531E-01	-4.273E-01	2.342E-02	4.000E-01	9.370E-03
4.800E+02	5.971E-02	1.000E+00	5.971E-02	6.174E+00	-2.818E+00	4.572E+00	-1.197E+00	2.129E-02	4.000E-01	8.515E-03
7.200E+02	2.684E-02	1.000E+00	2.684E-02	6.579E+00	-3.618E+00	9.357E+00	-1.972E+00	9.604E-03	4.000E-01	3.842E-03
							Total	9.693E-02		5.785E-02

For Information Only

Table 17. 14"GBB-101 Shine To Control Structure; Receiver At 6 Inches From Control Structure Wall, Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	4.771E+00	2.303E+00	1.099E+01	-1.792E+00	2.397E+00					
5.000E-01	1.295E+01	2.303E+00	2.982E+01	-6.931E-01	3.395E+00	4.025E+00	9.091E-01	6.852E-03	1.000E+00	6.852E-03
1.000E+00	3.113E+01	2.303E+00	7.169E+01	0.000E+00	4.272E+00	4.272E+00	1.265E+00	2.506E-02	1.000E+00	2.506E-02
2.000E+00	5.755E+01	1.690E+00	9.726E+01	6.931E-01	4.577E+00	4.272E+00	4.400E-01	8.530E-02	1.000E+00	8.530E-02
4.000E+00	4.155E+01	1.320E+00	5.485E+01	1.386E+00	4.005E+00	5.150E+00	-8.265E-01	1.433E-01	1.000E+00	1.433E-01
8.000E+00	2.625E+01	1.113E+00	2.922E+01	2.079E+00	3.375E+00	5.264E+00	-9.086E-01	1.570E-01	1.000E+00	1.570E-01
1.600E+01	1.335E+01	1.050E+00	1.402E+01	2.773E+00	2.640E+00	5.578E+00	-1.060E+00	1.587E-01	1.000E+00	1.587E-01
2.400E+01	8.365E+00	1.009E+00	8.440E+00	3.178E+00	2.133E+00	6.109E+00	-1.251E+00	8.646E-02	1.000E+00	8.646E-02
4.800E+01	5.102E+00	1.000E+00	5.102E+00	3.871E+00	1.630E+00	4.441E+00	-7.262E-01	1.546E-01	6.000E-01	9.277E-02
9.600E+01	4.732E+00	1.000E+00	4.732E+00	4.564E+00	1.554E+00	2.050E+00	-1.086E-01	2.349E-01	6.000E-01	1.409E-01
2.400E+02	3.145E+00	1.000E+00	3.145E+00	5.481E+00	1.146E+00	3.589E+00	-4.459E-01	5.423E-01	4.000E-01	2.169E-01
4.800E+02	1.377E+00	1.000E+00	1.377E+00	6.174E+00	3.199E-01	7.676E+00	-1.192E+00	4.899E-01	4.000E-01	1.960E-01
7.200E+02	6.281E-01	1.000E+00	6.281E-01	6.579E+00	-4.651E-01	1.227E+01	-1.936E+00	2.230E-01	4.000E-01	8.920E-02
							Total	2.307E+00		1.398E+00

For Information Only

Table 18. 14"GBB-101 Shine To Control Structure; Receiver At 1 Ft From Control Structure Wall, Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	4.344E+00	2.303E+00	1.000E+01	-1.792E+00	2.303E+00					
5.000E-01	1.179E+01	2.303E+00	2.715E+01	-6.931E-01	3.301E+00	3.932E+00	9.090E-01	6.238E-03	1.000E+00	6.238E-03
1.000E+00	2.835E+01	2.303E+00	6.529E+01	0.000E+00	4.179E+00	4.179E+00	1.266E+00	2.282E-02	1.000E+00	2.282E-02
2.000E+00	5.240E+01	1.690E+00	8.856E+01	6.931E-01	4.484E+00	4.179E+00	4.397E-01	7.767E-02	1.000E+00	7.767E-02
4.000E+00	3.783E+01	1.320E+00	4.994E+01	1.386E+00	3.911E+00	5.057E+00	-8.265E-01	1.305E-01	1.000E+00	1.305E-01
8.000E+00	2.390E+01	1.113E+00	2.660E+01	2.079E+00	3.281E+00	5.170E+00	-9.086E-01	1.429E-01	1.000E+00	1.429E-01
1.600E+01	1.215E+01	1.050E+00	1.276E+01	2.773E+00	2.546E+00	5.485E+00	-1.060E+00	1.445E-01	1.000E+00	1.445E-01
2.400E+01	7.617E+00	1.009E+00	7.686E+00	3.178E+00	2.039E+00	6.011E+00	-1.250E+00	7.871E-02	1.000E+00	7.871E-02
4.800E+01	4.645E+00	1.000E+00	4.645E+00	3.871E+00	1.536E+00	4.348E+00	-7.265E-01	1.408E-01	6.000E-01	8.447E-02
9.600E+01	4.308E+00	1.000E+00	4.308E+00	4.564E+00	1.460E+00	1.956E+00	-1.087E-01	2.138E-01	6.000E-01	1.283E-01
2.400E+02	2.863E+00	1.000E+00	2.863E+00	5.481E+00	1.052E+00	3.496E+00	-4.459E-01	4.937E-01	4.000E-01	1.975E-01
4.800E+02	1.253E+00	1.000E+00	1.253E+00	6.174E+00	2.255E-01	7.586E+00	-1.192E+00	4.459E-01	4.000E-01	1.784E-01
7.200E+02	5.719E-01	1.000E+00	5.719E-01	6.579E+00	-5.588E-01	1.217E+01	-1.934E+00	2.030E-01	4.000E-01	8.120E-02
							Total	2.101E+00		1.273E+00

For Information Only

Table 19. 14"GBB-101 Shine To Control Structure; Receiver At 3 Ft From Control Structure Wall, Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	3.192E+00	2.303E+00	7.351E+00	-1.792E+00	1.995E+00					
5.000E-01	8.663E+00	2.303E+00	1.995E+01	-6.931E-01	2.993E+00	3.623E+00	9.090E-01	4.584E-03	1.000E+00	4.584E-03
1.000E+00	2.083E+01	2.303E+00	4.797E+01	0.000E+00	3.871E+00	3.871E+00	1.266E+00	1.677E-02	1.000E+00	1.677E-02
2.000E+00	3.850E+01	1.690E+00	6.507E+01	6.931E-01	4.175E+00	3.871E+00	4.397E-01	5.707E-02	1.000E+00	5.707E-02
4.000E+00	2.779E+01	1.320E+00	3.668E+01	1.386E+00	3.602E+00	4.748E+00	-8.268E-01	9.584E-02	1.000E+00	9.584E-02
8.000E+00	1.756E+01	1.113E+00	1.954E+01	2.079E+00	2.973E+00	4.862E+00	-9.084E-01	1.050E-01	1.000E+00	1.050E-01
1.600E+01	8.929E+00	1.050E+00	9.375E+00	2.773E+00	2.238E+00	5.176E+00	-1.060E+00	1.062E-01	1.000E+00	1.062E-01
2.400E+01	5.596E+00	1.009E+00	5.646E+00	3.178E+00	1.731E+00	5.706E+00	-1.251E+00	5.783E-02	1.000E+00	5.783E-02
4.800E+01	3.412E+00	1.000E+00	3.412E+00	3.871E+00	1.227E+00	4.041E+00	-7.267E-01	1.034E-01	6.000E-01	6.205E-02
9.600E+01	3.165E+00	1.000E+00	3.165E+00	4.564E+00	1.152E+00	1.647E+00	-1.084E-01	1.571E-01	6.000E-01	9.426E-02
2.400E+02	2.103E+00	1.000E+00	2.103E+00	5.481E+00	7.434E-01	3.188E+00	-4.461E-01	3.627E-01	4.000E-01	1.451E-01
4.800E+02	9.207E-01	1.000E+00	9.207E-01	6.174E+00	-8.262E-02	7.274E+00	-1.192E+00	3.276E-01	4.000E-01	1.310E-01
7.200E+02	4.201E-01	1.000E+00	4.201E-01	6.579E+00	-8.673E-01	1.186E+01	-1.935E+00	1.491E-01	4.000E-01	5.965E-02
							Total	1.543E+00		9.353E-01

For Information Only

Table 20. 14"GBB-101 Shine To Control Structure; Receiver At 5 Ft From Control Structure Wall, Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	2.517E+00	2.303E+00	5.797E+00	-1.792E+00	1.757E+00					
5.000E-01	6.831E+00	2.303E+00	1.573E+01	-6.931E-01	2.756E+00	3.386E+00	9.090E-01	3.614E-03	1.000E+00	3.614E-03
1.000E+00	1.642E+01	2.303E+00	3.782E+01	0.000E+00	3.633E+00	3.633E+00	1.265E+00	1.322E-02	1.000E+00	1.322E-02
2.000E+00	3.036E+01	1.690E+00	5.131E+01	6.931E-01	3.938E+00	3.633E+00	4.402E-01	4.499E-02	1.000E+00	4.499E-02
4.000E+00	2.191E+01	1.320E+00	2.892E+01	1.386E+00	3.365E+00	4.511E+00	-8.271E-01	7.557E-02	1.000E+00	7.557E-02
8.000E+00	1.385E+01	1.113E+00	1.542E+01	2.079E+00	2.735E+00	4.623E+00	-9.078E-01	8.280E-02	1.000E+00	8.280E-02
1.600E+01	7.041E+00	1.050E+00	7.393E+00	2.773E+00	2.001E+00	4.940E+00	-1.060E+00	8.372E-02	1.000E+00	8.372E-02
2.400E+01	4.413E+00	1.009E+00	4.453E+00	3.178E+00	1.494E+00	5.468E+00	-1.250E+00	4.561E-02	1.000E+00	4.561E-02
4.800E+01	2.691E+00	1.000E+00	2.691E+00	3.871E+00	9.899E-01	3.803E+00	-7.265E-01	8.156E-02	6.000E-01	4.894E-02
9.600E+01	2.496E+00	1.000E+00	2.496E+00	4.564E+00	9.147E-01	1.410E+00	-1.085E-01	1.239E-01	6.000E-01	7.434E-02
2.400E+02	1.658E+00	1.000E+00	1.658E+00	5.481E+00	5.056E-01	2.952E+00	-4.464E-01	2.860E-01	4.000E-01	1.144E-01
4.800E+02	7.261E-01	1.000E+00	7.261E-01	6.174E+00	-3.201E-01	7.034E+00	-1.191E+00	2.583E-01	4.000E-01	1.033E-01
7.200E+02	3.313E-01	1.000E+00	3.313E-01	6.579E+00	-1.105E+00	1.163E+01	-1.935E+00	1.176E-01	4.000E-01	4.704E-02
							Total	1.217E+00		7.376E-01

For Information Only

Table 21. 14"GBB-101 Shine To Control Structure; Receiver At 10 Ft From Control Structure Wall, Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	1.636E+00	2.303E+00	3.768E+00	-1.792E+00	1.326E+00					
5.000E-01	4.441E+00	2.303E+00	1.023E+01	-6.931E-01	2.325E+00	2.955E+00	9.092E-01	2.350E-03	1.000E+00	2.350E-03
1.000E+00	1.068E+01	2.303E+00	2.460E+01	0.000E+00	3.203E+00	3.203E+00	1.266E+00	8.598E-03	1.000E+00	8.598E-03
2.000E+00	1.973E+01	1.690E+00	3.334E+01	6.931E-01	3.507E+00	3.203E+00	4.390E-01	2.925E-02	1.000E+00	2.925E-02
4.000E+00	1.425E+01	1.320E+00	1.881E+01	1.386E+00	2.934E+00	4.079E+00	-8.259E-01	4.913E-02	1.000E+00	4.913E-02
8.000E+00	9.002E+00	1.113E+00	1.002E+01	2.079E+00	2.305E+00	4.194E+00	-9.087E-01	5.384E-02	1.000E+00	5.384E-02
1.600E+01	4.577E+00	1.050E+00	4.806E+00	2.773E+00	1.570E+00	4.509E+00	-1.060E+00	5.442E-02	1.000E+00	5.442E-02
2.400E+01	2.868E+00	1.009E+00	2.894E+00	3.178E+00	1.063E+00	5.038E+00	-1.251E+00	2.964E-02	1.000E+00	2.964E-02
4.800E+01	1.748E+00	1.000E+00	1.748E+00	3.871E+00	5.585E-01	3.374E+00	-7.273E-01	5.299E-02	6.000E-01	3.179E-02
9.600E+01	1.621E+00	1.000E+00	1.621E+00	4.564E+00	4.830E-01	9.797E-01	-1.088E-01	8.047E-02	6.000E-01	4.828E-02
2.400E+02	1.077E+00	1.000E+00	1.077E+00	5.481E+00	7.418E-02	2.520E+00	-4.462E-01	1.857E-01	4.000E-01	7.430E-02
4.800E+02	4.716E-01	1.000E+00	4.716E-01	6.174E+00	-7.516E-01	6.604E+00	-1.191E+00	1.678E-01	4.000E-01	6.712E-02
7.200E+02	2.152E-01	1.000E+00	2.152E-01	6.579E+00	-1.536E+00	1.119E+01	-1.935E+00	7.639E-02	4.000E-01	3.056E-02
							Total	7.906E-01		4.793E-01

For Information Only

Table 22. 14"GBB-101 Shine To Control Structure; Receiver At 15 Ft From Control Structure Wall, Calculation Of AST DBA-LOCA 30 Day TID To The Control Room Habitability Envelope; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
(hr)			(mr/hr)					(Rads)		
1.667E-01	1.192E+00	2.303E+00	2.745E+00	-1.792E+00	1.010E+00					
5.000E-01	3.236E+00	2.303E+00	7.453E+00	-6.931E-01	2.009E+00	2.639E+00	9.092E-01	1.712E-03	1.000E+00	1.712E-03
1.000E+00	7.779E+00	2.303E+00	1.792E+01	0.000E+00	2.886E+00	2.886E+00	1.265E+00	6.263E-03	1.000E+00	6.263E-03
2.000E+00	1.438E+01	1.690E+00	2.430E+01	6.931E-01	3.191E+00	2.886E+00	4.399E-01	2.131E-02	1.000E+00	2.131E-02
4.000E+00	1.038E+01	1.320E+00	1.370E+01	1.386E+00	2.618E+00	3.764E+00	-8.267E-01	3.580E-02	1.000E+00	3.580E-02
8.000E+00	6.560E+00	1.113E+00	7.301E+00	2.079E+00	1.988E+00	3.876E+00	-9.081E-01	3.922E-02	1.000E+00	3.922E-02
1.600E+01	3.335E+00	1.050E+00	3.502E+00	2.773E+00	1.253E+00	4.192E+00	-1.060E+00	3.966E-02	1.000E+00	3.966E-02
2.400E+01	2.089E+00	1.009E+00	2.108E+00	3.178E+00	7.456E-01	4.724E+00	-1.252E+00	2.160E-02	1.000E+00	2.160E-02
4.800E+01	1.271E+00	1.000E+00	1.271E+00	3.871E+00	2.398E-01	3.065E+00	-7.298E-01	3.856E-02	6.000E-01	2.314E-02
9.600E+01	1.178E+00	1.000E+00	1.178E+00	4.564E+00	1.638E-01	6.642E-01	-1.096E-01	5.849E-02	6.000E-01	3.510E-02
2.400E+02	7.820E-01	1.000E+00	7.820E-01	5.481E+00	-2.459E-01	2.205E+00	-4.471E-01	1.349E-01	4.000E-01	5.397E-02
4.800E+02	3.423E-01	1.000E+00	3.423E-01	6.174E+00	-1.072E+00	6.287E+00	-1.192E+00	1.218E-01	4.000E-01	4.872E-02
7.200E+02	1.563E-01	1.000E+00	1.563E-01	6.579E+00	-1.856E+00	1.086E+01	-1.933E+00	5.546E-02	4.000E-01	2.219E-02
							Total	5.748E-01		3.487E-01

For Information Only

Table 23. 14"GBB-101 Shine To Main Control Room (Room C-409) and And Technical Support Center (Room C-410), Calculation Of AST DBA-LOCA 30 Day TID; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	7.931E-03	4.835E+01	3.835E-01	-1.792E+00	-9.585E-01					
5.000E-01	2.139E-02	4.835E+01	1.034E+00	-6.931E-01	3.363E-02	6.597E-01	9.033E-01	2.381E-04	1.000E+00	2.381E-04
1.000E+00	5.102E-02	4.835E+01	2.467E+00	0.000E+00	9.029E-01	9.029E-01	1.254E+00	8.650E-04	1.000E+00	8.650E-04
2.000E+00	9.314E-02	2.800E+01	2.608E+00	6.931E-01	9.586E-01	9.029E-01	8.025E-02	2.545E-03	1.000E+00	2.545E-03
4.000E+00	6.680E-02	1.700E+01	1.136E+00	1.386E+00	1.272E-01	1.790E+00	-1.199E+00	3.377E-03	1.000E+00	3.377E-03
8.000E+00	4.277E-02	9.490E+00	4.059E-01	2.079E+00	-9.017E-01	2.185E+00	-1.484E+00	2.675E-03	1.000E+00	2.675E-03
1.600E+01	2.328E-02	4.000E+00	9.312E-02	2.773E+00	-2.374E+00	3.515E+00	-2.124E+00	1.563E-03	1.000E+00	1.563E-03
2.400E+01	1.634E-02	1.408E+00	2.301E-02	3.178E+00	-3.772E+00	7.186E+00	-3.448E+00	3.830E-04	1.000E+00	3.830E-04
4.800E+01	1.345E-02	1.408E+00	1.894E-02	3.871E+00	-3.967E+00	-2.880E+00	-2.808E-01	4.962E-04	6.000E-01	2.977E-04
9.600E+01	1.464E-02	1.000E+00	1.464E-02	4.564E+00	-4.224E+00	-2.529E+00	-3.713E-01	7.897E-04	6.000E-01	4.738E-04
2.400E+02	1.059E-02	1.000E+00	1.059E-02	5.481E+00	-4.548E+00	-2.611E+00	-3.534E-01	1.757E-03	4.000E-01	7.029E-04
4.800E+02	4.641E-03	1.000E+00	4.641E-03	6.174E+00	-5.373E+00	1.975E+00	-1.190E+00	1.651E-03	4.000E-01	6.602E-04
7.200E+02	2.028E-03	1.000E+00	2.028E-03	6.579E+00	-6.201E+00	7.233E+00	-2.042E+00	7.367E-04	4.000E-01	2.947E-04
							Total	1.708E-02		1.407E-02

For Information Only

Table 24. 12"GBB-107 Shine To Main Control Room (Room C-409) and And Technical Support Center (Room C-410); Receiver At 6 Inches From Control Structure Wall, Calculation Of AST DBA-LOCA 30 Day TID; 3 FT Concrete Shield Wall

Time Post Accident (hr)	Direct Shine Dose Rate (mr/hr)	Direct Shine Dose Correction Factor For RADTRAD	Corrected Shine Dose Rate (mr/hr)	LN(t)	LN(rate)	A1	A2	TID EDE Each Time Step (Rem)	CRHE Occupancy Factor	Cumulative TID EDE (Rem)
1.667E-01	1.415E-01	2.303E+00	3.259E-01	-1.792E+00	-1.121E+00					
5.000E-01	3.840E-01	2.303E+00	8.844E-01	-6.931E-01	-1.229E-01	5.071E-01	9.089E-01	2.032E-04	1.000E+00	2.032E-04
1.000E+00	9.235E-01	2.303E+00	2.127E+00	0.000E+00	7.546E-01	7.546E-01	1.266E+00	7.434E-04	1.000E+00	7.434E-04
2.000E+00	1.708E+00	1.690E+00	2.887E+00	6.931E-01	1.060E+00	7.546E-01	4.406E-01	2.531E-03	1.000E+00	2.531E-03
4.000E+00	1.233E+00	1.320E+00	1.628E+00	1.386E+00	4.871E-01	1.633E+00	-8.266E-01	4.252E-03	1.000E+00	4.252E-03
8.000E+00	7.791E-01	1.113E+00	8.671E-01	2.079E+00	-1.426E-01	1.746E+00	-9.084E-01	4.659E-03	1.000E+00	4.659E-03
1.600E+01	3.958E-01	1.050E+00	4.156E-01	2.773E+00	-8.781E-01	2.064E+00	-1.061E+00	4.708E-03	1.000E+00	4.708E-03
2.400E+01	2.476E-01	1.009E+00	2.498E-01	3.178E+00	-1.387E+00	2.602E+00	-1.255E+00	2.561E-03	1.000E+00	2.561E-03
4.800E+01	1.497E-01	1.000E+00	1.497E-01	3.871E+00	-1.899E+00	9.612E-01	-7.389E-01	4.556E-03	6.000E-01	2.734E-03
9.600E+01	1.378E-01	1.000E+00	1.378E-01	4.564E+00	-1.982E+00	-1.437E+00	-1.195E-01	6.863E-03	6.000E-01	4.118E-03
2.400E+02	9.116E-02	1.000E+00	9.116E-02	5.481E+00	-2.395E+00	7.627E-02	-4.509E-01	1.575E-02	4.000E-01	6.301E-03
4.800E+02	3.994E-02	1.000E+00	3.994E-02	6.174E+00	-3.220E+00	4.130E+00	-1.191E+00	1.421E-02	4.000E-01	5.682E-03
7.200E+02	1.829E-02	1.000E+00	1.829E-02	6.579E+00	-4.001E+00	8.672E+00	-1.926E+00	6.480E-03	4.000E-01	2.592E-03
							Total	6.752E-02		4.109E-02

For Information Only

Table 25. Summary Of Shine Dose To Main Control Room (C-409) and TSC (C-410) from 14"GBB-101 Core Spray Pipe and 12"GBB-107 RHR Pipe; Receiver At 6 Inches From Control Structure Wall; 3 FT Concrete Shield Wall

	14"GBB-101		12"GBB-107		TOTAL	
Time Post Accident (hr)	Shine Dose Rate (mr/hr)	Cumulative 30 Day TID EDE (Rem)	Shine Dose Rate (mr/hr)	Cumulative 30 Day TID EDE (Rem)	Shine Dose Rate (mr/hr)	Cumulative 30 Day TID EDE (Rem)
1.667E-01	3.835E-01		3.259E-01		7.093E-01	
5.000E-01	1.034E+00	2.381E-04	8.844E-01	2.032E-04	1.919E+00	4.413E-04
1.000E+00	2.467E+00	8.650E-04	2.127E+00	7.434E-04	4.594E+00	1.608E-03
2.000E+00	2.608E+00	2.545E-03	2.887E+00	2.531E-03	5.494E+00	5.076E-03
4.000E+00	1.136E+00	3.377E-03	1.628E+00	4.252E-03	2.763E+00	7.629E-03
8.000E+00	4.059E-01	2.675E-03	8.671E-01	4.659E-03	1.273E+00	7.333E-03
1.600E+01	9.312E-02	1.563E-03	4.156E-01	4.708E-03	5.087E-01	6.271E-03
2.400E+01	2.301E-02	3.830E-04	2.498E-01	2.561E-03	2.728E-01	2.944E-03
4.800E+01	1.894E-02	2.977E-04	1.497E-01	2.734E-03	1.686E-01	3.031E-03
9.600E+01	1.464E-02	4.738E-04	1.378E-01	4.118E-03	1.524E-01	4.592E-03
2.400E+02	1.059E-02	7.029E-04	9.116E-02	6.301E-03	1.018E-01	7.004E-03
4.800E+02	4.641E-03	6.602E-04	3.994E-02	5.682E-03	4.458E-02	6.343E-03
7.200E+02	2.028E-03	2.947E-04	1.829E-02	2.592E-03	2.032E-02	2.887E-03
		1.407E-02		4.109E-02		5.516E-02

For Information Only

ATTACHMENT 1
CONTROL ROOM HABITABILITY ENVELOPE FIGURES

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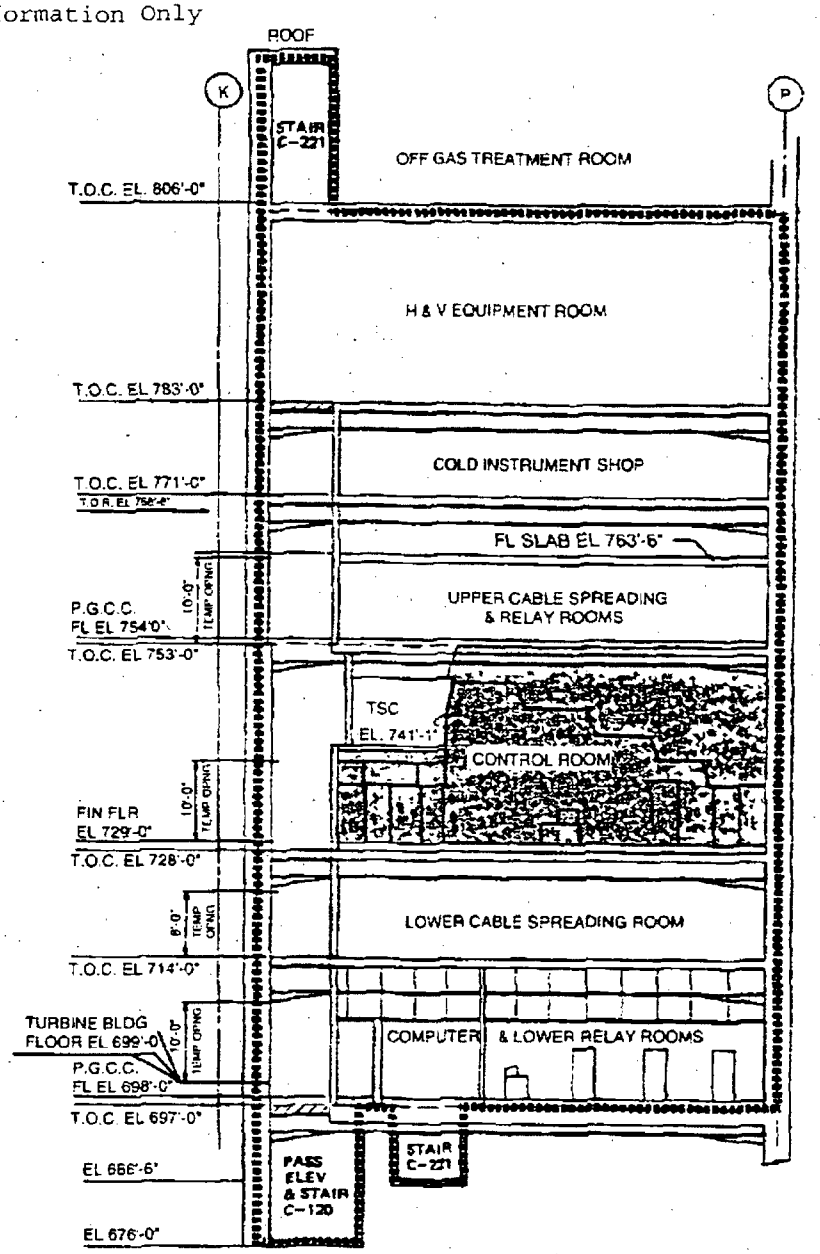


NOTES:
- SHADED AREA - CONTROL ROOM
- DOTTED AREA - CONTROL STRUCTURE ENVELOPE
- FIGURE TO BE USED FOR HABITABILITY ZONE INFORMATION ONLY.

FSAR REV. 55

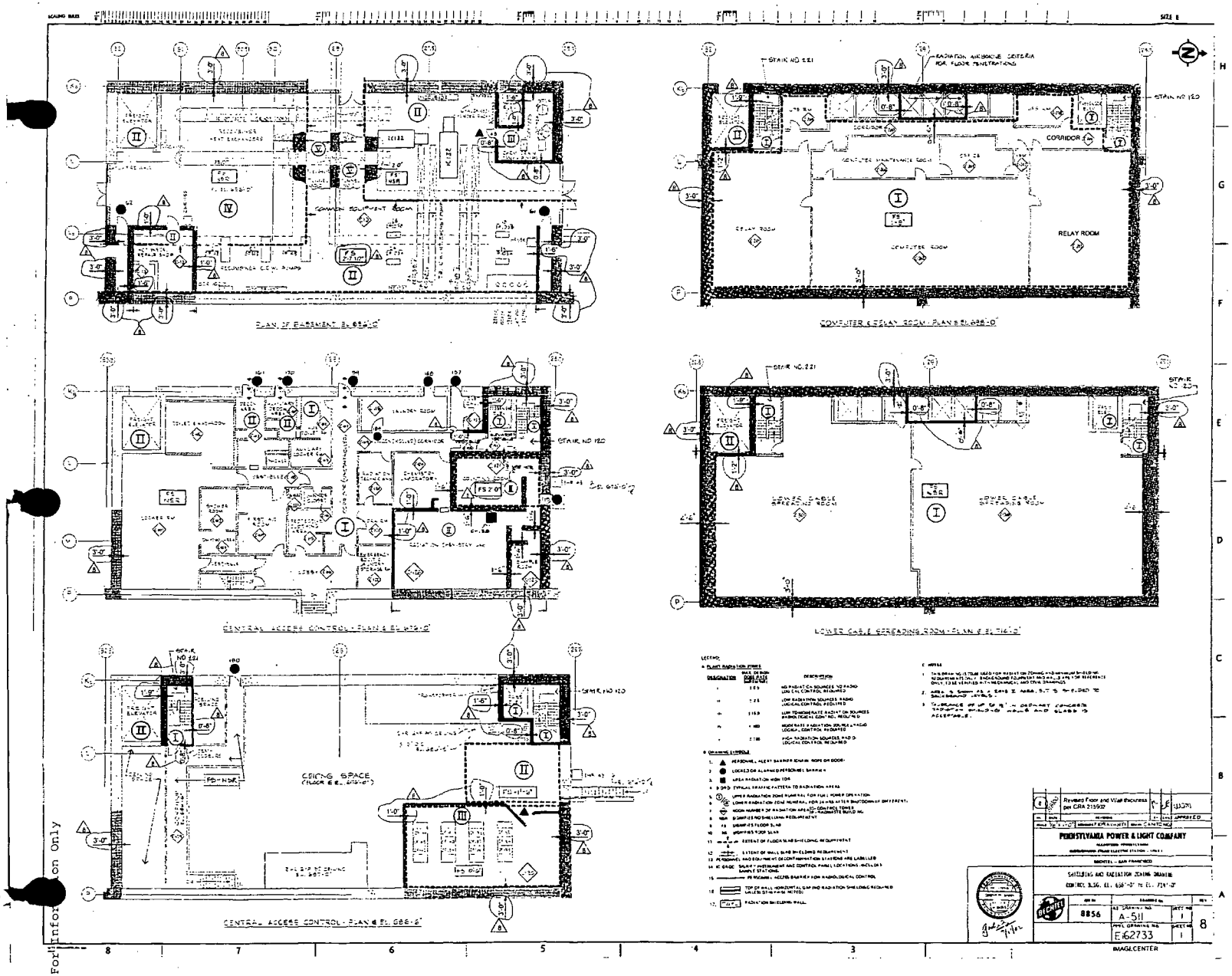
SUSQUEHANNA STEAM ELECTRIC STATION
UNITS 1 AND 2
FINAL SAFETY ANALYSIS REPORT

CONTROL STRUCTURE
ELEVATION

FIGURE 6.4-1A, Rev. 54

IMAGE CENTER

For Information Only



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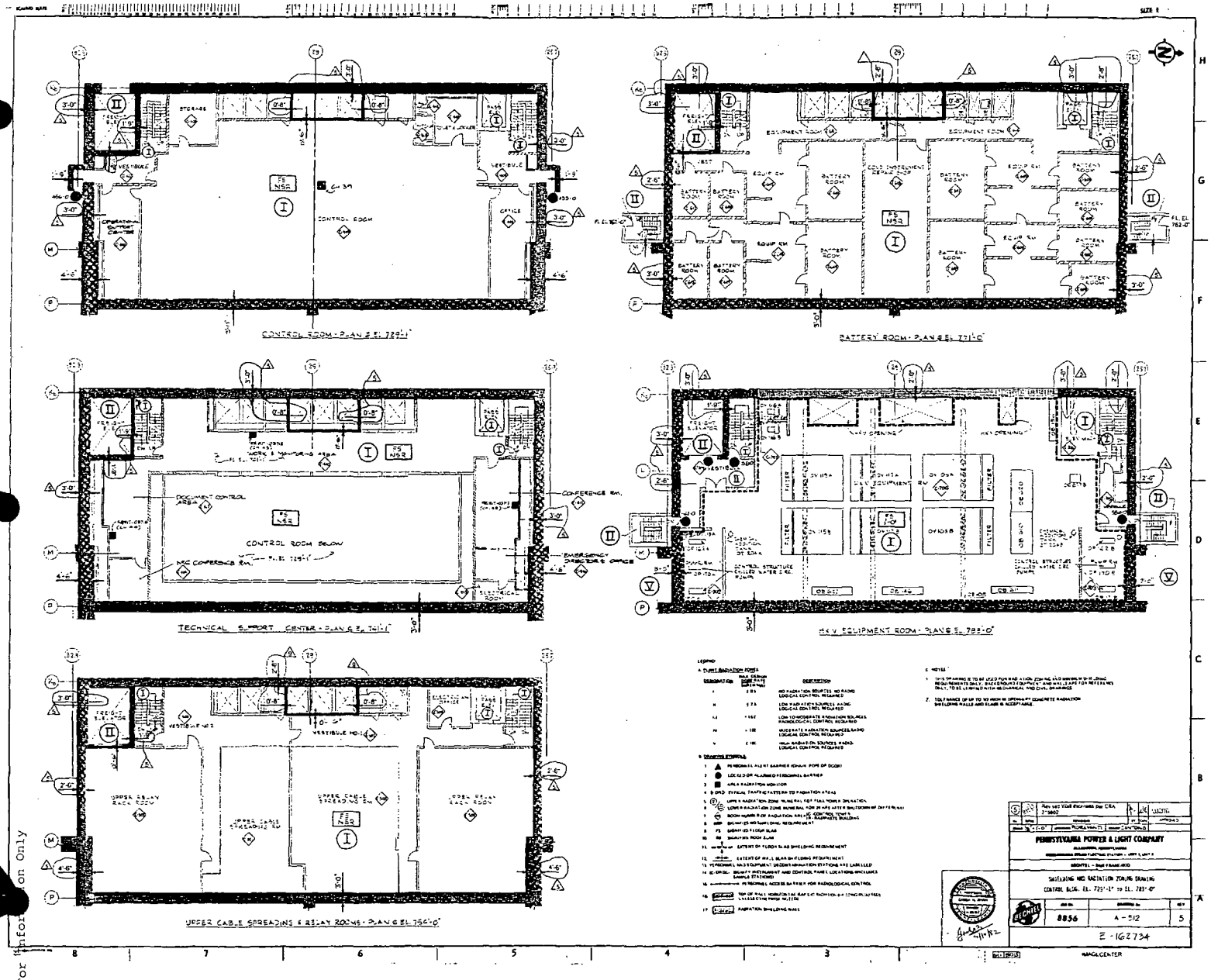

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ATTACHMENT 2
DBA-LOCA CONTAINED SYSTEM SOURCES

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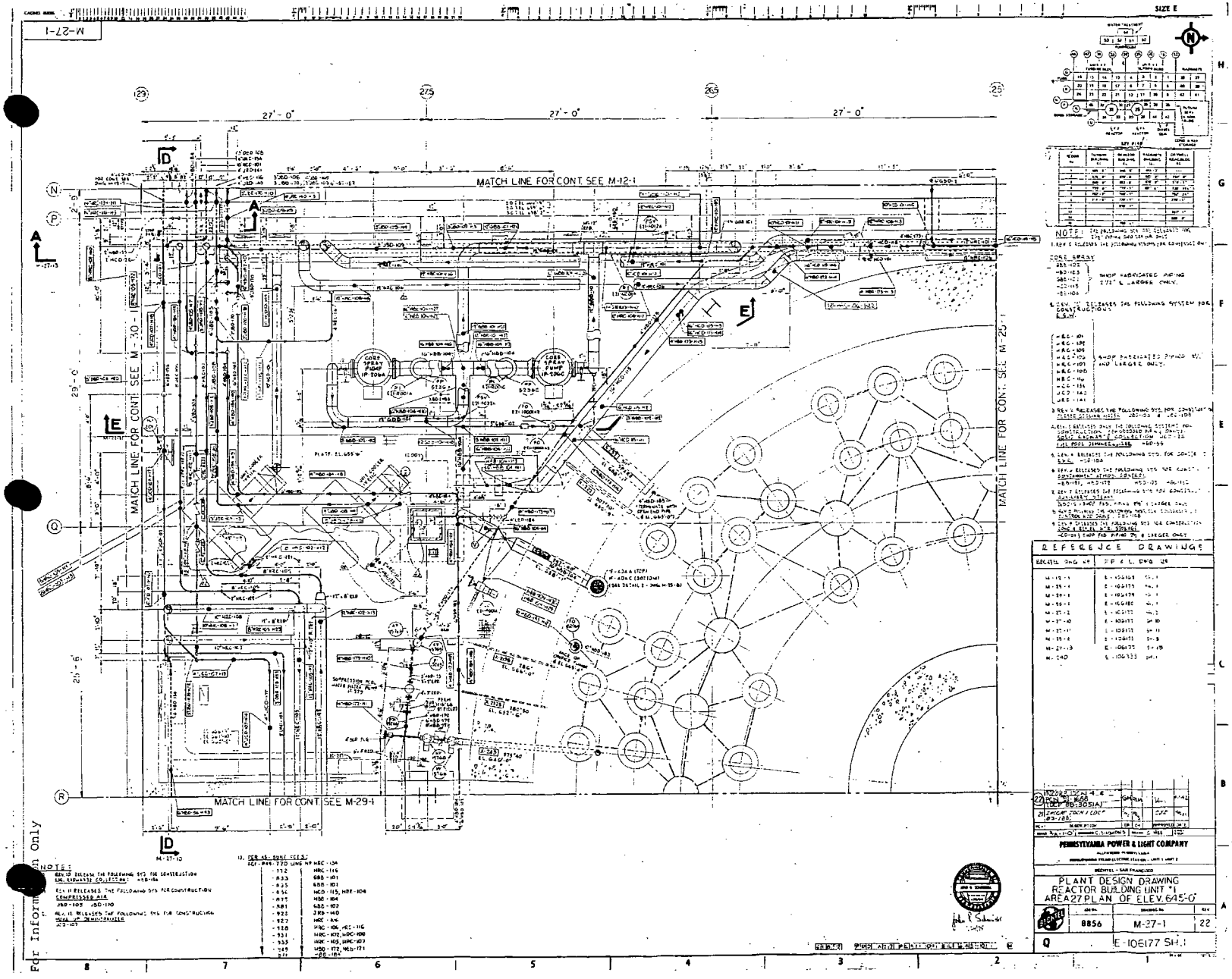

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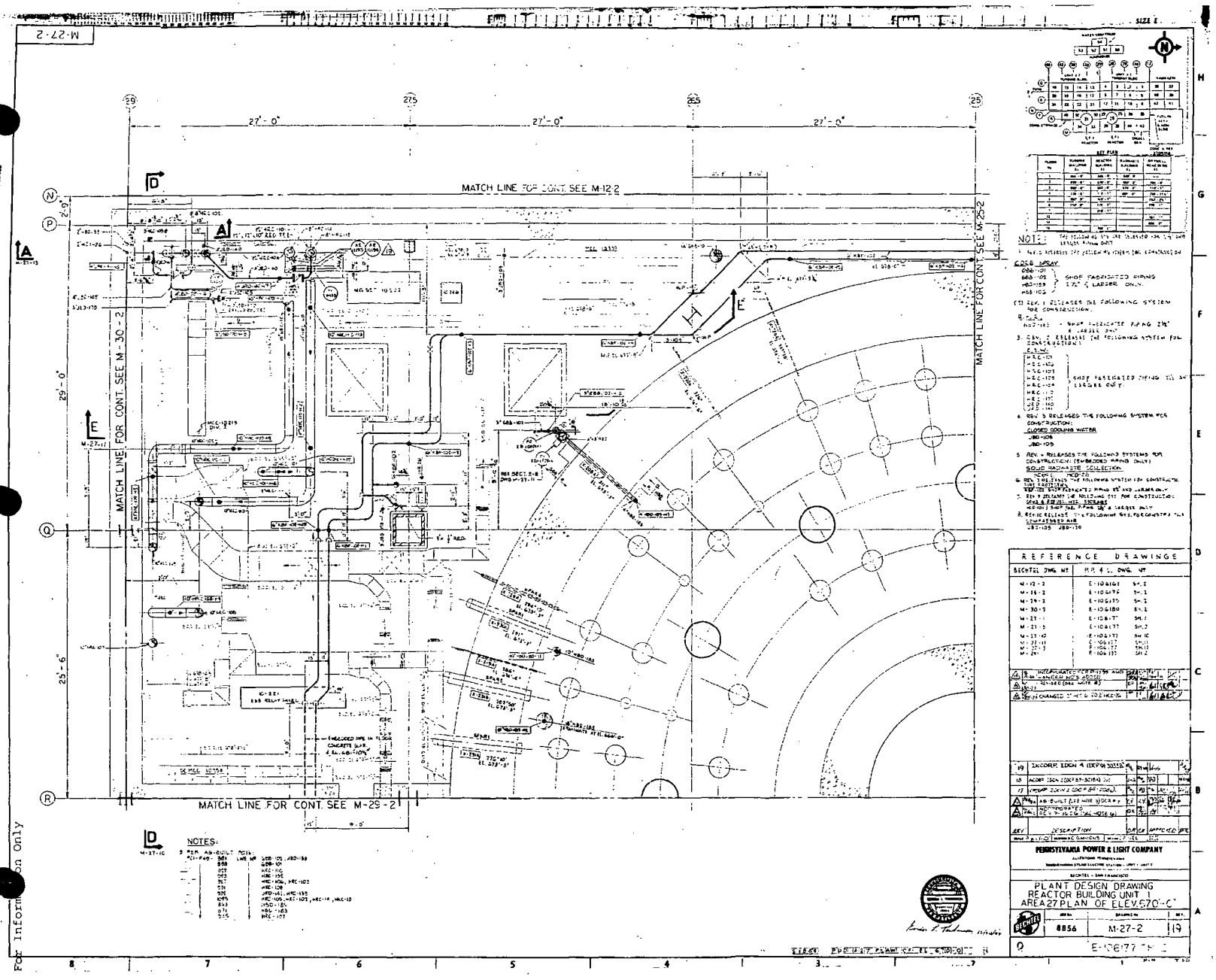

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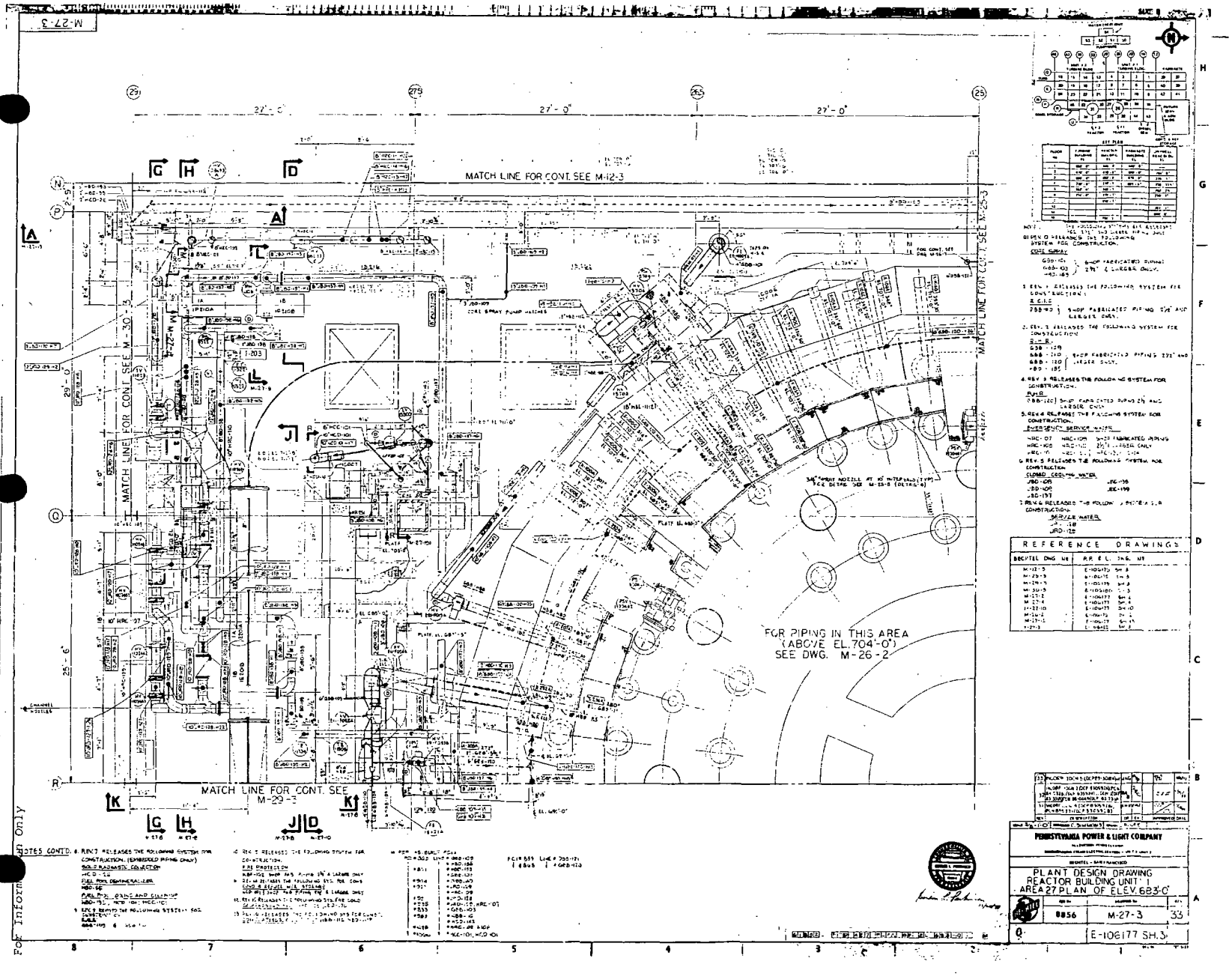
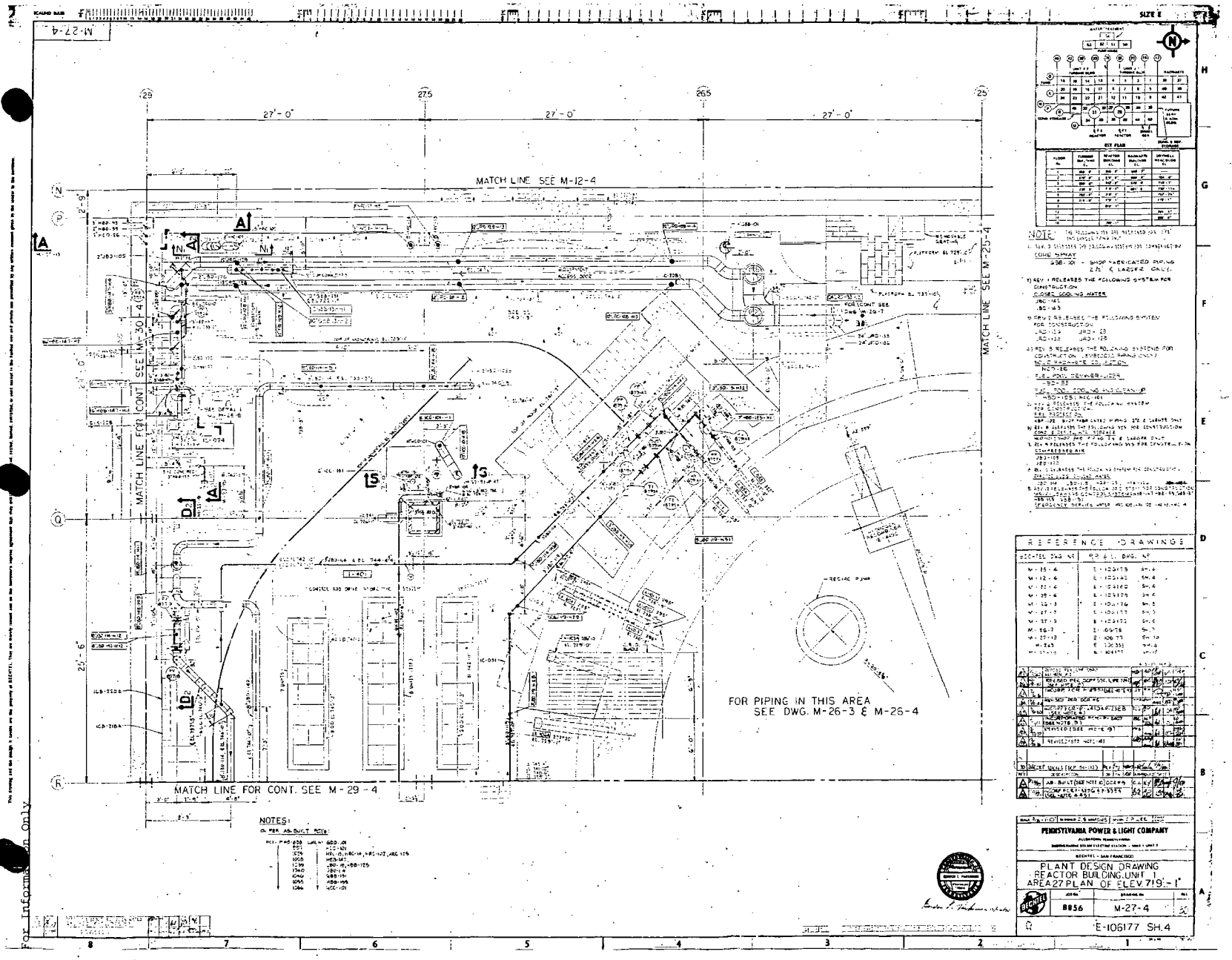


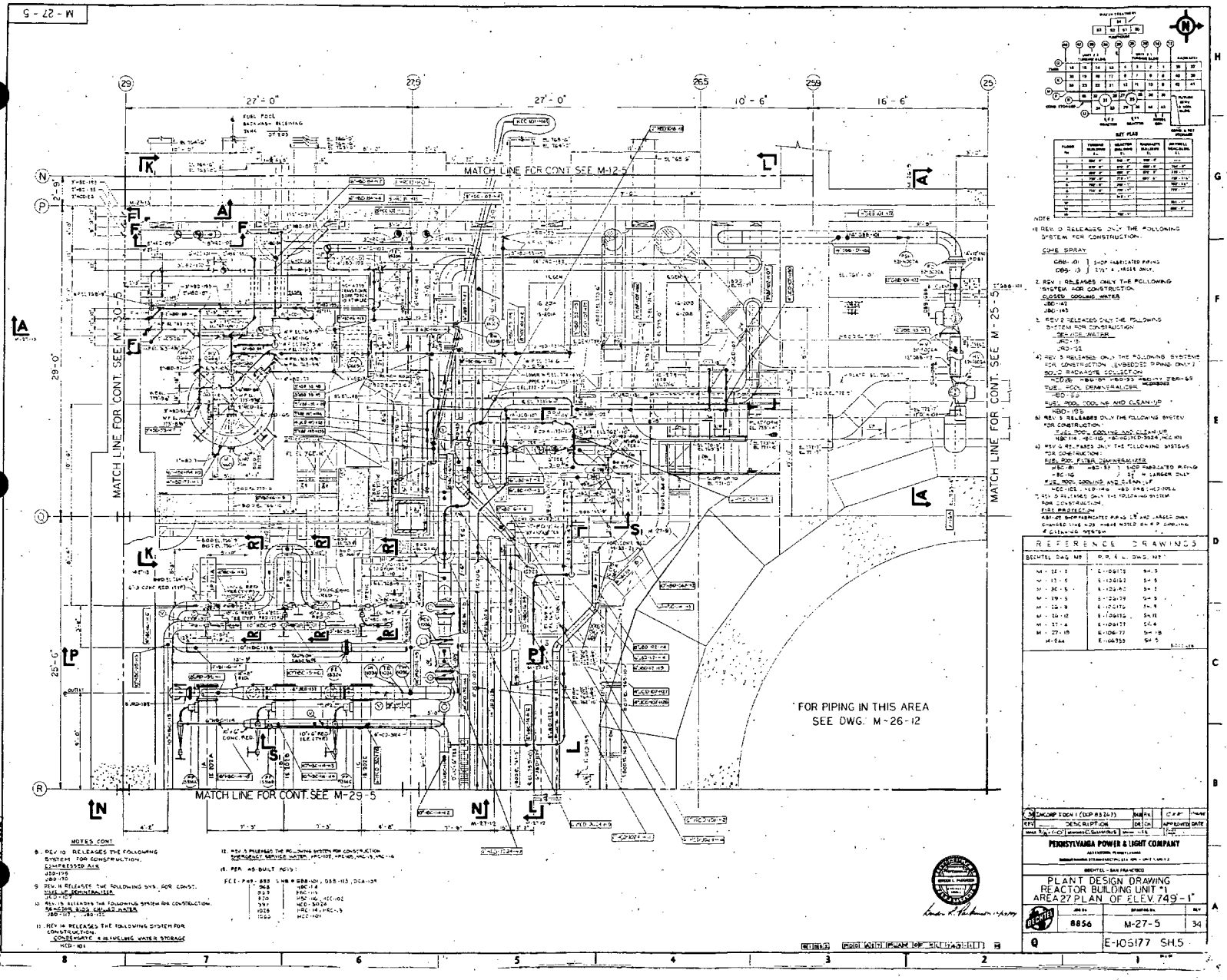
For Information Only

For Information Only



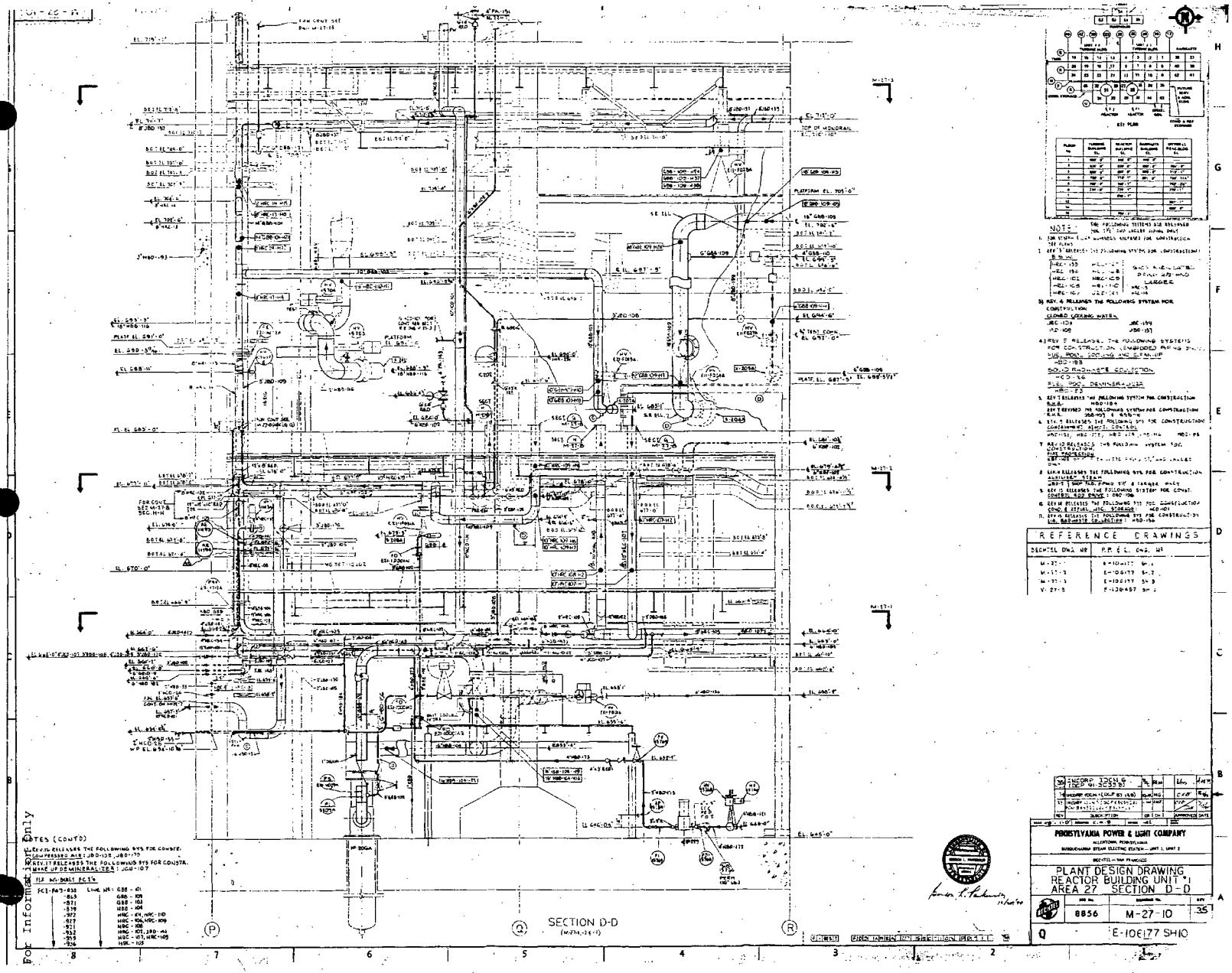
For Information Only

For Information Only



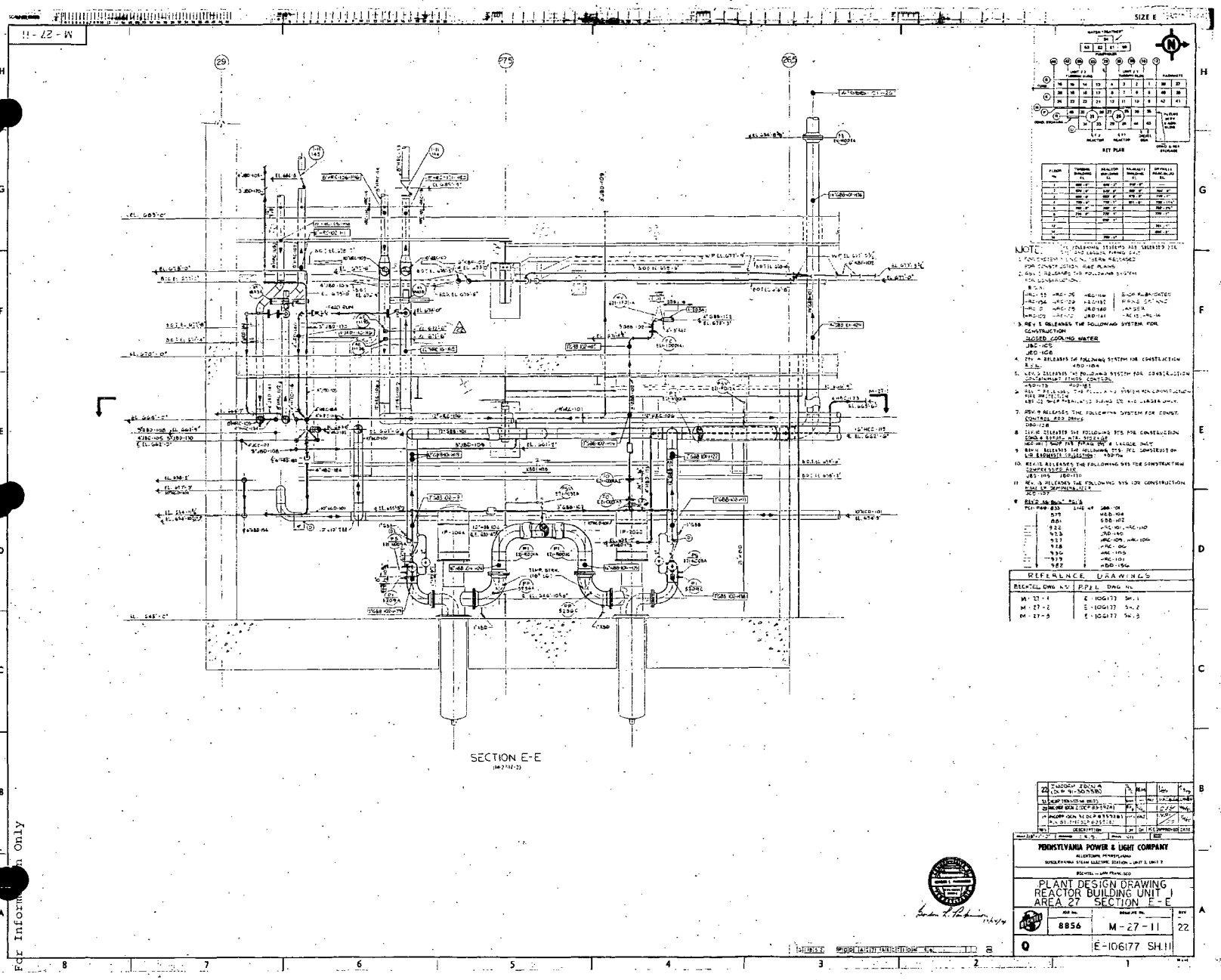
For Information Only

For Information Only

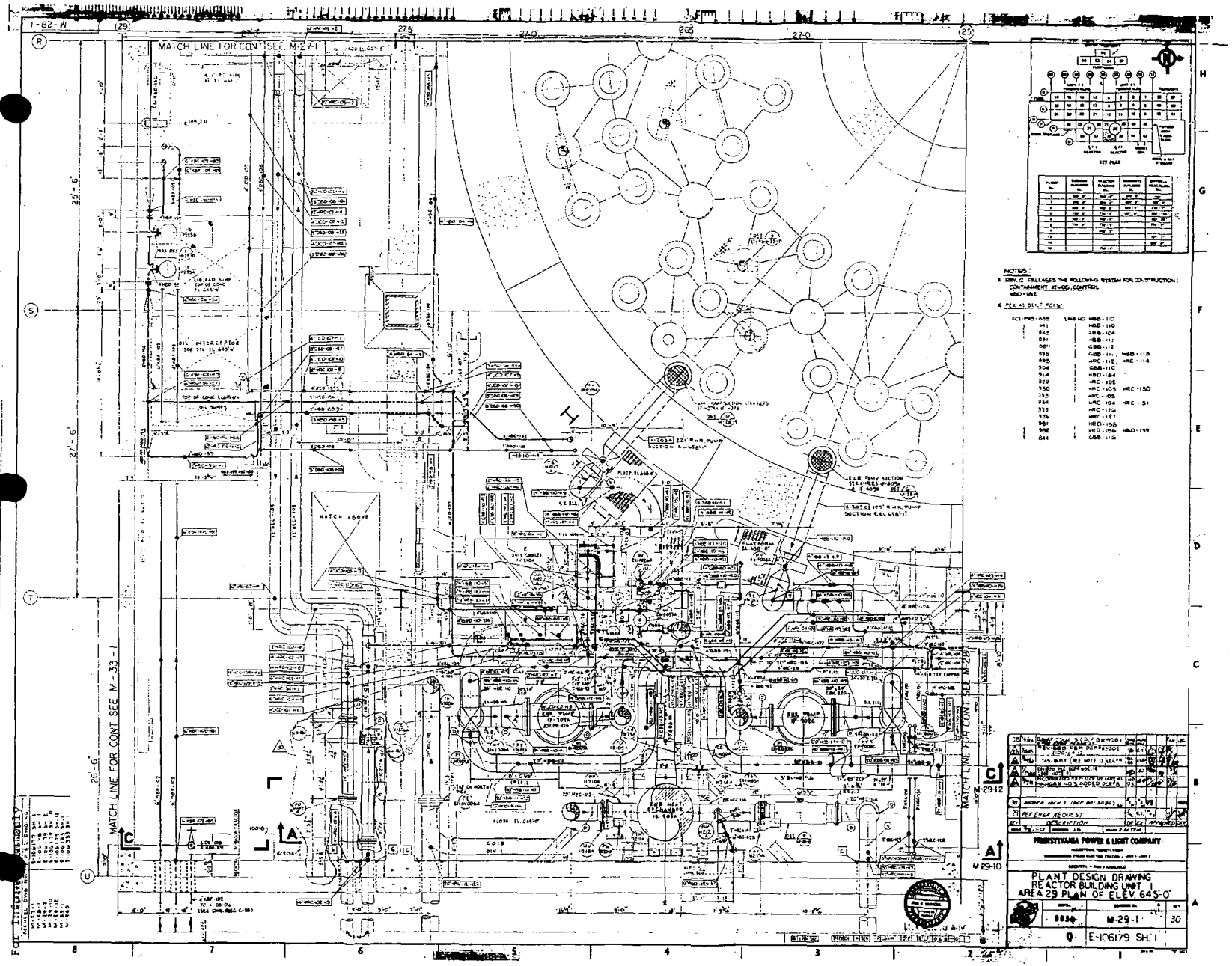


For Information Only

For Information Only

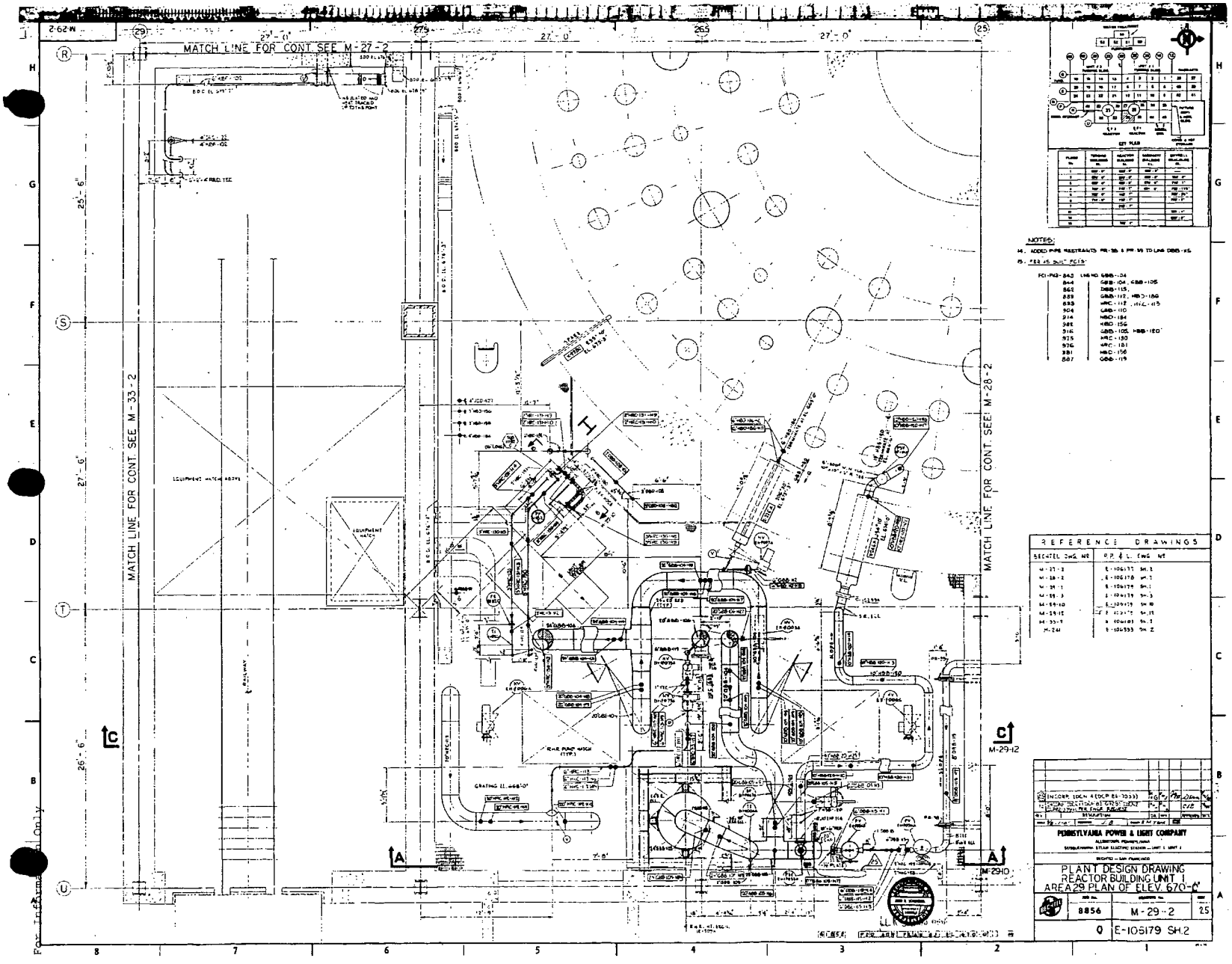


For Information Only



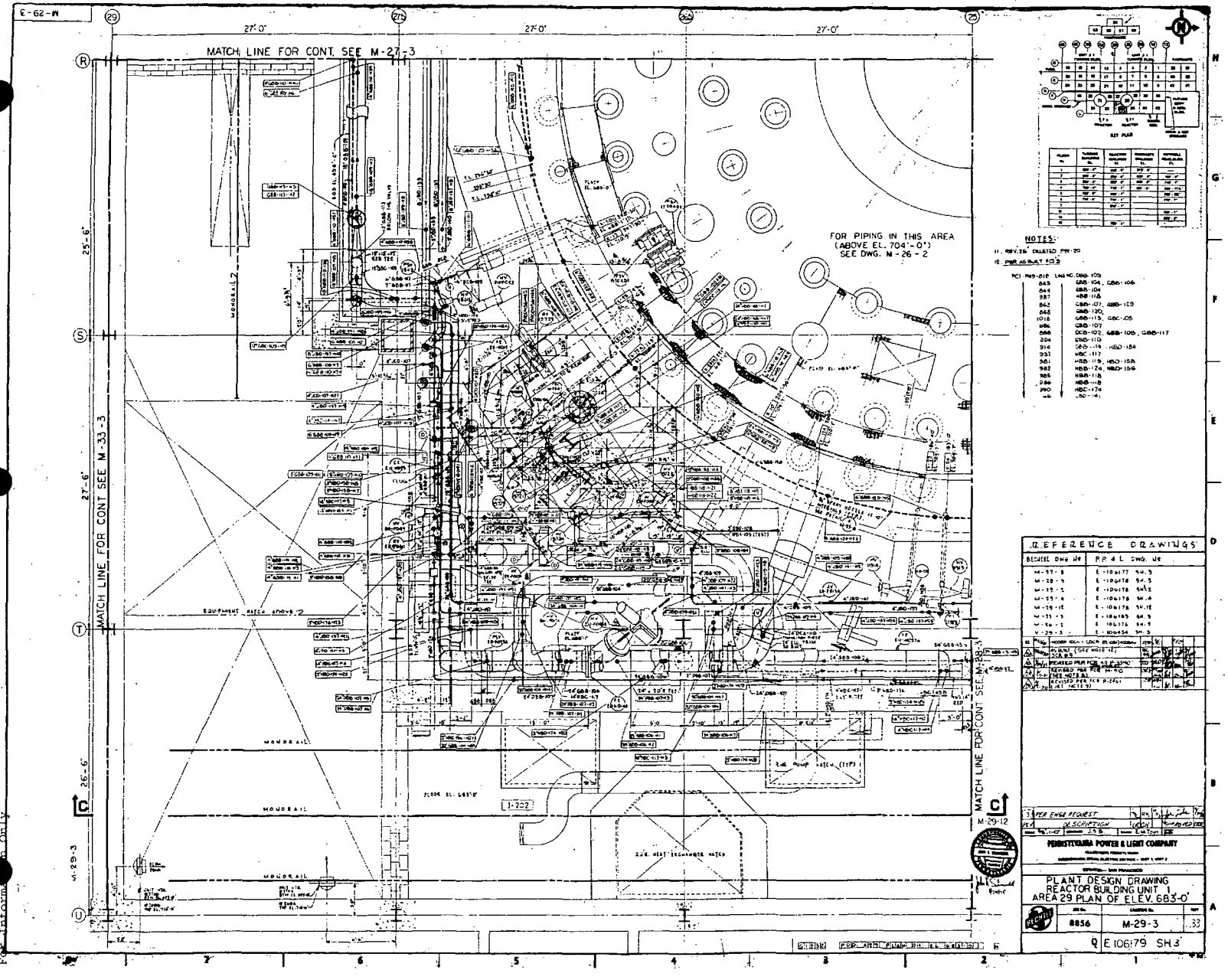
For Information Only

For Information Only



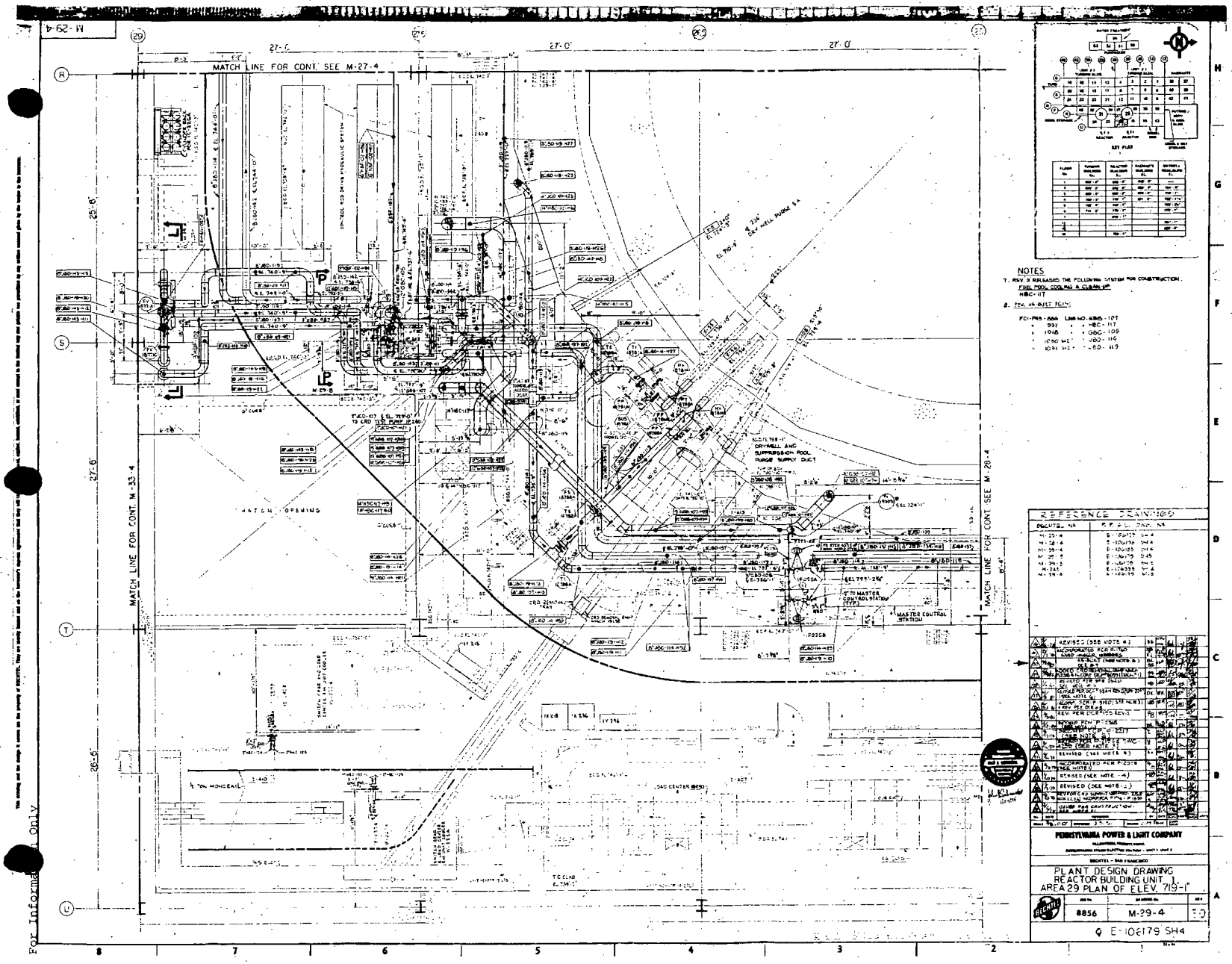
For Information Only

For Information Only



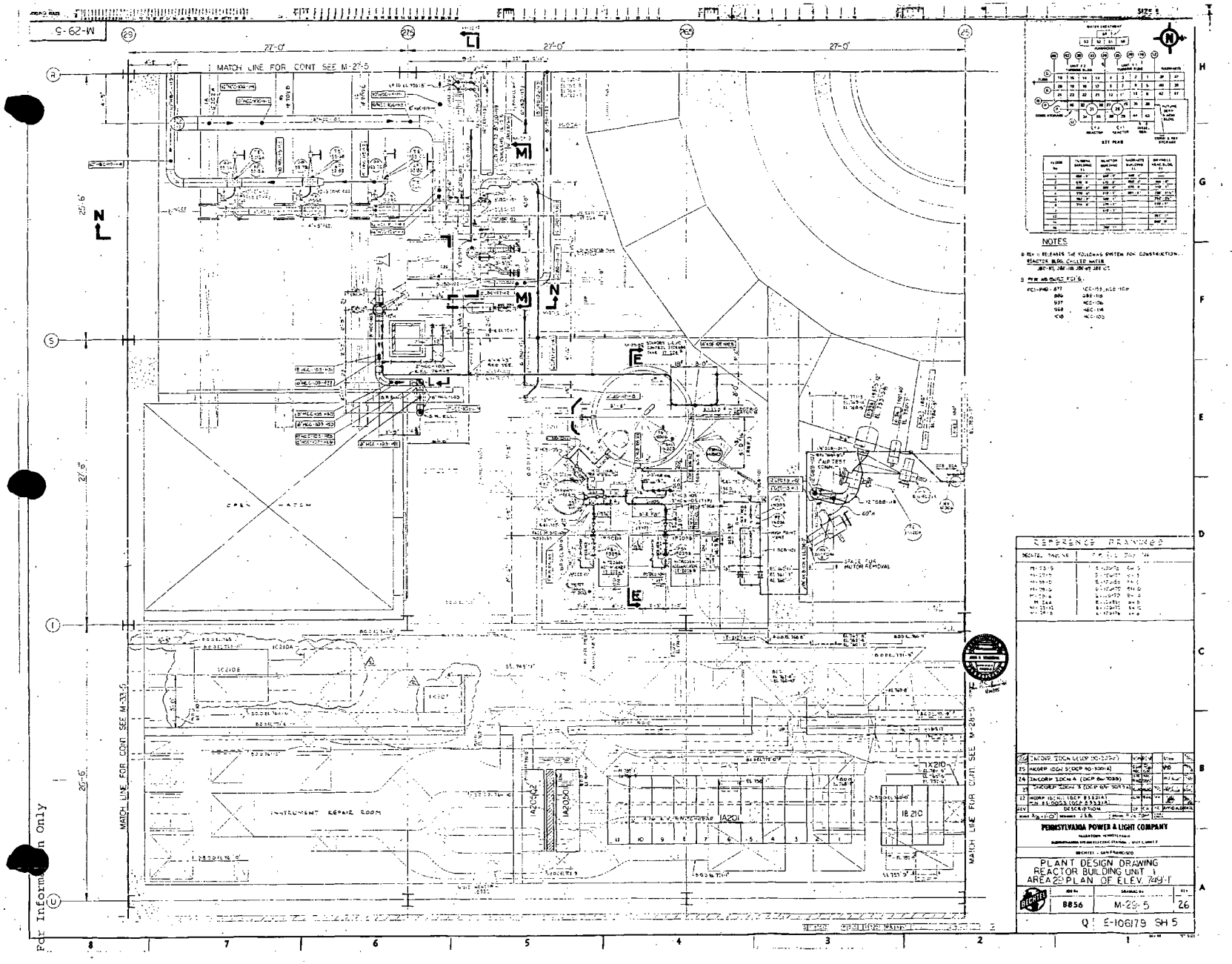
For Information Only

For Information Only



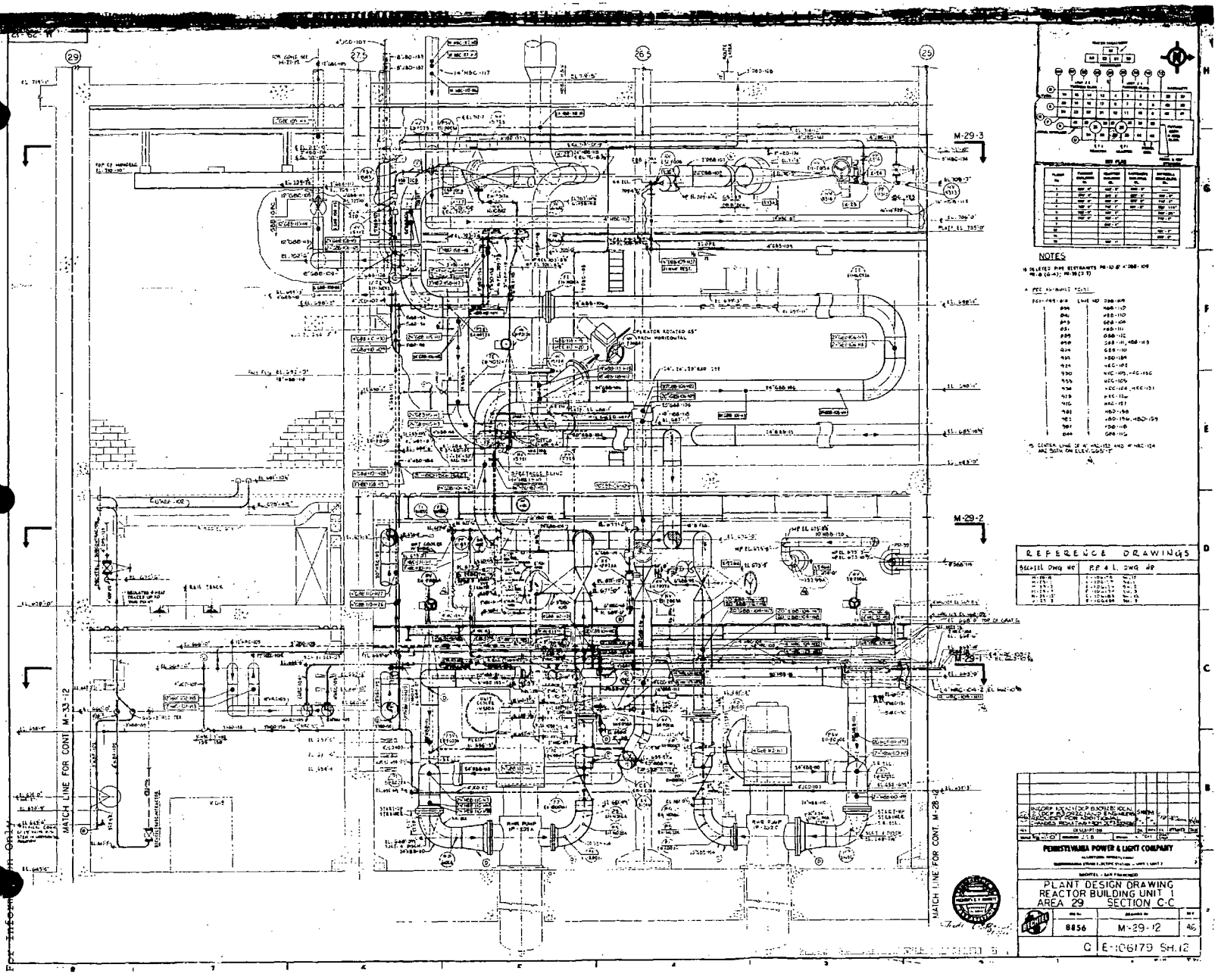
For Information Only

For Information Only



For Information Only

For Information Only



For Information Only

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ATTACHMENT 3
MICROSHIELD COMPUTER CODE OUTPUTS
CONTAINMENT SHINE

Note:
The activity source terms provided in Table 1 are based on a secondary containment bypass leakage rate of 15 scfh (Ref. EC-RADN-1125, Revision 3). Since the change in the containment airborne sources for 15 scfh versus 9 scfh (Reference EC-RADN-1125, Revision 2) was a decrease affecting the third significant digit, the MICROSHIELD code was not re-run for this insignificant change. The MICROSHIELD computer code outputs given in Attachment 3 are conservative for 15 scfh but still reflect a bypass leakage rate of 9 scfh.

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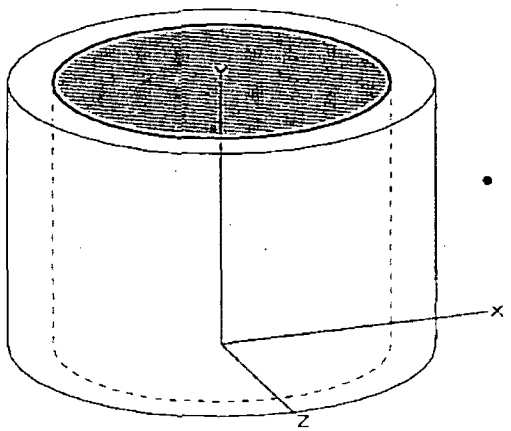
Pennsylvania Power & Light Co.

Page : 1
DOS File: PCCR1.MS5
Run Date: September 2, 2005
Run Time: 3:23:25 PM
Duration: 00:00:17

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

Case Title: PCCR.
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 0.1667 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241				
Ba-137m	2.5637e+005	9.4855e+015	3.7788e+001	1.3982e+006
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	3.6000e+005	1.3320e+016	5.3064e+001	1.9634e+006
Cs-136	1.1500e+005	4.2550e+015	1.6951e+001	6.2719e+005
Cs-137	2.7100e+005	1.0027e+016	3.9945e+001	1.4780e+006
I-131	1.6800e+006	6.2160e+016	2.4763e+002	9.1624e+006
I-132	2.3700e+006	8.7690e+016	3.4934e+002	1.2925e+007
I-133	3.4700e+006	1.2839e+017	5.1148e+002	1.8925e+007
I-134	3.3800e+006	1.2506e+017	4.9821e+002	1.8434e+007
I-135	3.2500e+006	1.2025e+017	4.7905e+002	1.7725e+007
Kr-85	2.4700e+004	9.1390e+014	3.6408e+000	1.3471e+005
Kr-85m	4.3600e+005	1.6132e+016	6.4266e+001	2.3779e+006
Kr-87	8.1600e+005	3.0192e+016	1.2028e+002	4.4503e+006
Kr-88	1.1900e+006	4.4030e+016	1.7541e+002	6.4900e+006
La-140				
La-141				

DOS File: PCCR1.MS5
Run Date: September 2, 2005
Run Time: 3:23:25 PM
Duration: 00:00:17

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99				
Nb-95				
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	3.4000e+003	1.2580e+014	5.0116e-001	1.8543e+004
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Xe-133	3.5400e+006	1.3098e+017	5.2180e+002	1.9306e+007
Xe-135	1.1900e+006	4.4030e+016	1.7541e+002	6.4900e+006
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.398e+16	0.000e+00	5.380e-20	0.000e+00	4.614e-21

DOS File: PCCR1.MS5
Run Date: September 2, 2005
Run Time: 3:23:25 PM
Duration: 00:00:17

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	7.356e+16	0.000e+00	9.848e-19	0.000e+00	9.760e-21
0.04	2.923e+14	6.498e-163	1.038e-20	2.874e-165	4.590e-23
0.06	5.303e+14	1.410e-76	4.418e-19	2.801e-79	8.774e-22
0.08	4.996e+16	1.257e-52	9.902e-17	1.990e-55	1.567e-19
0.1	1.042e+14	2.006e-46	9.548e-19	3.070e-49	1.461e-21
0.15	2.045e+16	5.649e-35	1.026e-15	9.302e-38	1.690e-18
0.2	5.816e+16	4.987e-30	6.789e-15	8.801e-33	1.198e-17
0.3	1.709e+16	3.749e-25	2.635e-15	7.112e-28	4.999e-18
0.4	9.171e+16	6.727e-21	1.292e-14	1.311e-23	2.517e-17
0.5	1.610e+17	4.698e-18	2.077e-14	9.221e-21	4.076e-17
0.6	1.882e+17	5.921e-16	4.080e-13	1.156e-18	7.963e-16
0.8	3.492e+17	1.245e-12	4.115e-10	2.367e-15	7.827e-13
1.0	1.353e+17	8.255e-11	1.542e-08	1.522e-13	2.841e-11
1.5	1.080e+17	3.349e-07	2.517e-05	5.635e-10	4.234e-08
2.0	5.389e+16	3.114e-05	1.365e-03	4.815e-08	2.111e-06
3.0	4.562e+15	1.220e-03	2.788e-02	1.655e-06	3.783e-05
TOTALS:	1.326e+18	1.251e-03	2.927e-02	1.704e-06	3.998e-05

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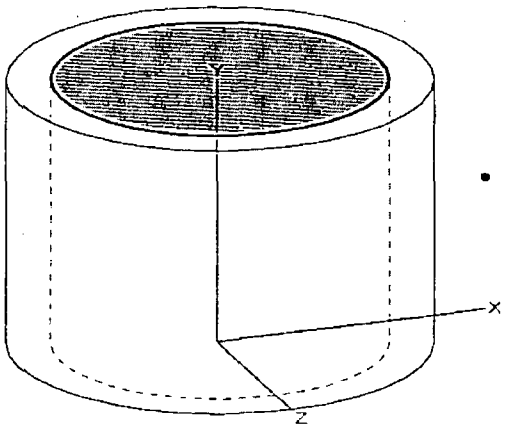
Pennsylvania Power & Light Co.

Page : 1
DOS File: PCCR2.MS5
Run Date: September 2, 2005
Run Time: 3:24:46 PM
Duration: 00:00:17

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 0.5 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241				
Ba-137m	6.8017e+005	2.5166e+016	1.0026e+002	3.7095e+006
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	9.5600e+005	3.5372e+016	1.4091e+002	5.2138e+006
Cs-136	3.0500e+005	1.1285e+016	4.4957e+001	1.6634e+006
Cs-137	7.1900e+005	2.6603e+016	1.0598e+002	3.9213e+006
I-131	4.4800e+006	1.6576e+017	6.6035e+002	2.4433e+007
I-132	6.0600e+006	2.2422e+017	8.9324e+002	3.3050e+007
I-133	9.1800e+006	3.3966e+017	1.3531e+003	5.0066e+007
I-134	6.9400e+006	2.5678e+017	1.0230e+003	3.7849e+007
I-135	8.4100e+006	3.1117e+017	1.2396e+003	4.5866e+007
Kr-85	7.4000e+004	2.7380e+015	1.0908e+001	4.0358e+005
Kr-85m	1.2400e+006	4.5880e+016	1.8278e+002	6.7627e+006
Kr-87	2.0400e+006	7.5480e+016	3.0070e+002	1.1126e+007
Kr-88	3.3000e+006	1.2210e+017	4.8642e+002	1.7998e+007
La-140				
La-141				

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99				
Nb-95				
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	9.0200e+003	3.3374e+014	1.3295e+000	4.9193e+004
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Xe-133	1.0600e+007	3.9220e+017	1.5624e+003	5.7810e+007
Xe-135	3.6800e+006	1.3616e+017	5.4243e+002	2.0070e+007
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.047e+16	0.000e+00	1.557e-19	0.000e+00	1.335e-20

For Information Only
DOS File: PCCR2.MS5
Run Date: September 2, 2005
Run Time: 3:24:46 PM
Duration: 00:00:17

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	2.165e+17	0.000e+00	2.899e-18	0.000e+00	2.873e-20
0.04	7.754e+14	1.724e-162	2.753e-20	7.624e-165	1.218e-22
0.06	1.406e+15	3.740e-76	1.172e-18	7.428e-79	2.327e-21
0.08	1.490e+17	3.749e-52	2.953e-16	5.933e-55	4.673e-19
0.1	2.869e+14	5.524e-46	2.628e-18	8.451e-49	4.021e-21
0.15	5.317e+16	1.469e-34	2.669e-15	2.419e-37	4.395e-18
0.2	1.707e+17	1.464e-29	1.993e-14	2.584e-32	3.518e-17
0.3	4.486e+16	9.840e-25	6.917e-15	1.867e-27	1.312e-17
0.4	2.319e+17	1.701e-20	3.267e-14	3.314e-23	6.365e-17
0.5	4.139e+17	1.207e-17	5.338e-14	2.370e-20	1.048e-16
0.6	4.637e+17	1.459e-15	1.005e-12	2.847e-18	1.962e-15
0.8	7.862e+17	2.802e-12	9.265e-10	5.330e-15	1.762e-12
1.0	3.245e+17	1.981e-10	3.699e-08	3.651e-13	6.818e-11
1.5	2.716e+17	8.423e-07	6.329e-05	1.417e-09	1.065e-07
2.0	1.389e+17	8.024e-05	3.517e-03	1.241e-07	5.439e-06
3.0	1.150e+16	3.074e-03	7.027e-02	4.171e-06	9.533e-05
TOTALS:	3.319e+18	3.155e-03	7.385e-02	4.296e-06	1.009e-04

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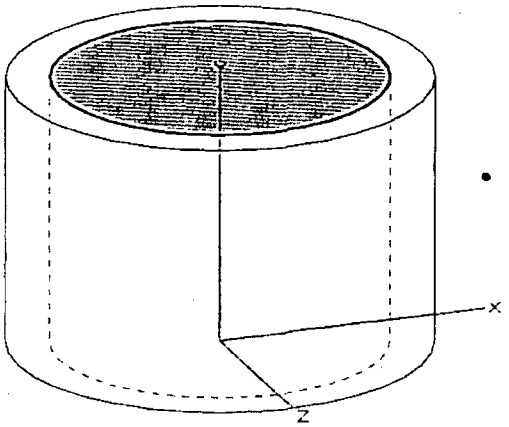
Pennsylvania Power & Light Co.

Page : 1
DOS File: PCCR3.MS5
Date: September 2, 2005
Time: 3:25:03 PM
Duration: 00:00:19

EC-RADN-1129
Page 105

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 1 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241	1.5300e+000	5.6610e+010	2.2552e-004	8.3443e+000
Ba-137m	1.5231e+006	5.6353e+016	2.2450e+002	8.3065e+006
Ba-139	7.0900e+005	2.6233e+016	1.0451e+002	3.8667e+006
Ba-140	1.1700e+006	4.3290e+016	1.7246e+002	6.3809e+006
Ce-141	2.7000e+004	9.9900e+014	3.9798e+000	1.4725e+005
Ce-143	2.4500e+004	9.0650e+014	3.6113e+000	1.3362e+005
Ce-144	2.2700e+004	8.3990e+014	3.3460e+000	1.2380e+005
Cm-242	4.0000e+002	1.4800e+013	5.8960e-002	2.1815e+003
Cm-244	2.3100e+001	8.5470e+011	3.4049e-003	1.2598e+002
Co-58	4.4500e+002	1.6465e+013	6.5593e-002	2.4269e+003
Co-60	2.3900e+002	8.8430e+012	3.5229e-002	1.3035e+003
Cs-134	2.1400e+006	7.9180e+016	3.1544e+002	1.1671e+007
Cs-136	6.8300e+005	2.5271e+016	1.0067e+002	3.7249e+006
Cs-137	1.6100e+006	5.9570e+016	2.3731e+002	8.7806e+006
I-131	1.1700e+007	4.3290e+017	1.7246e+003	6.3809e+007
I-132	1.5300e+007	5.6610e+017	2.2552e+003	8.3443e+007
I-133	2.3500e+007	8.6950e+017	3.4639e+003	1.2816e+008
I-134	1.2200e+007	4.5140e+017	1.7983e+003	6.6536e+007
I-135	2.0800e+007	7.6960e+017	3.0659e+003	1.1344e+008
Kr-85	5.4300e+005	2.0091e+016	8.0038e+001	2.9614e+006
Kr-85m	8.4200e+006	3.1154e+017	1.2411e+003	4.5921e+007
Kr-87	1.1400e+007	4.2180e+017	1.6804e+003	6.2173e+007
Kr-88	2.1400e+007	7.9180e+017	3.1544e+003	1.1671e+008
La-140	1.8300e+004	6.7710e+014	2.6974e+000	9.9804e+004
La-141	8.9500e+003	3.3115e+014	1.3192e+000	4.8811e+004

DOS File: PCCR3.MS5
Run Date: September 2, 2005
Run Time: 3:25:03 PM
Duration: 00:00:19

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	6.6700e+003	2.4679e+014	9.8316e-001	3.6377e+004
Mo-99	1.5000e+005	5.5500e+015	2.2110e+001	8.1807e+005
Nb-95	1.1500e+004	4.2550e+014	1.6951e+000	6.2719e+004
Nd-147	4.3500e+003	1.6095e+014	6.4119e-001	2.3724e+004
Np-239	3.1500e+005	1.1655e+016	4.6431e+001	1.7179e+006
Pr-143	9.6700e+003	3.5779e+014	1.4254e+000	5.2738e+004
Pr-144	2.2375e+004	8.2789e+014	3.2981e+000	1.2203e+005
Pu-238	6.8400e+001	2.5308e+012	1.0082e-002	3.7304e+002
Pu-239	7.2700e+000	2.6899e+011	1.0716e-003	3.9649e+001
Pu-240	1.1700e+001	4.3290e+011	1.7246e-003	6.3809e+001
Pu-241	2.8800e+003	1.0656e+014	4.2451e-001	1.5707e+004
Rb-86	2.0200e+004	7.4740e+014	2.9775e+000	1.1017e+005
Rh-103m	1.2866e+005	4.7604e+015	1.8965e+001	7.0169e+005
Rh-105	8.3300e+004	3.0821e+015	1.2278e+001	4.5430e+005
Rh-106	5.1500e+004	1.9055e+015	7.5911e+000	2.8087e+005
Ru-103	1.2900e+005	4.7730e+015	1.9015e+001	7.0354e+005
Ru-105	7.6400e+004	2.8268e+015	1.1261e+001	4.1667e+005
Ru-106	5.1500e+004	1.9055e+015	7.5911e+000	2.8087e+005
Sb-127	1.4000e+005	5.1800e+015	2.0636e+001	7.6353e+005
Sb-129	4.4400e+005	1.6428e+016	6.5446e+001	2.4215e+006
Sr-89	6.1700e+005	2.2829e+016	9.0946e+001	3.3650e+006
Sr-90	7.8700e+004	2.9119e+015	1.1600e+001	4.2921e+005
Sr-91	7.3200e+005	2.7084e+016	1.0790e+002	3.9922e+006
Sr-92	6.4700e+005	2.3939e+016	9.5368e+001	3.5286e+006
Tc-99m	1.3400e+005	4.9580e+015	1.9752e+001	7.3081e+005
Te-127	1.4000e+005	5.1800e+015	2.0636e+001	7.6353e+005
Te-127m	2.3900e+004	8.8430e+014	3.5229e+000	1.3035e+005
Te-129	4.7200e+005	1.7464e+016	6.9573e+001	2.5742e+006
Te-129m	9.9900e+004	3.6963e+015	1.4725e+001	5.4483e+005
Te-131m	3.1500e+005	1.1655e+016	4.6431e+001	1.7179e+006
Te-132	2.2900e+006	8.4730e+016	3.3755e+002	1.2489e+007
Xe-133	7.7700e+007	2.8749e+018	1.1453e+004	4.2376e+008
Xe-135	2.7400e+007	1.0138e+018	4.0388e+003	1.4943e+008
Y-90	1.0600e+003	3.9220e+013	1.5624e-001	5.7810e+003
Y-91	8.0800e+003	2.9896e+014	1.1910e+000	4.4067e+004
Y-92	4.5500e+004	1.6835e+015	6.7067e+000	2.4815e+005
Y-93	5.9900e+003	2.2163e+014	8.8293e-001	3.2668e+004
Zr-95	1.1500e+004	4.2550e+014	1.6951e+000	6.2719e+004
Zr-97	1.1000e+004	4.0700e+014	1.6214e+000	5.9992e+004

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

gy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.971e+17	0.000e+00	1.143e-18	0.000e+00	9.804e-20

DOS File: PCCR3.MS5
Run Date: September 2, 2005
Run Time: 3:25:03 PM
Duration: 00:00:19

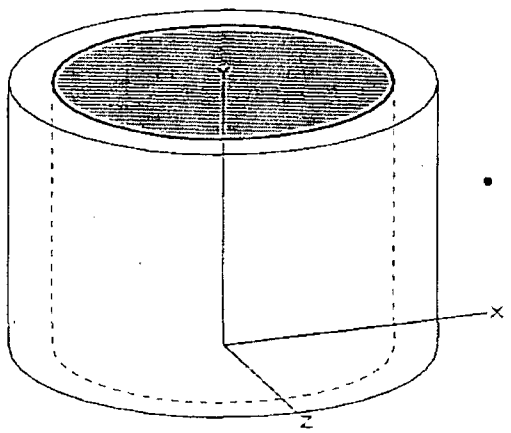
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	9.730e+14	0.000e+00	5.891e-21	0.000e+00	2.041e-22
0.03	1.561e+18	0.000e+00	2.089e-17	0.000e+00	2.071e-19
0.04	2.997e+15	6.662e-162	1.064e-19	2.947e-164	4.706e-22
0.05	1.114e+16	8.968e-102	1.293e-18	2.389e-104	3.444e-21
0.06	3.464e+15	9.210e-76	2.885e-18	1.829e-78	5.731e-21
0.08	1.069e+18	2.689e-51	2.118e-15	4.255e-54	3.351e-18
0.1	1.437e+16	2.767e-44	1.317e-16	4.234e-47	2.015e-19
0.15	3.028e+17	8.365e-34	1.520e-14	1.378e-36	2.503e-17
0.2	1.235e+18	1.059e-28	1.442e-13	1.869e-31	2.545e-16
0.3	1.483e+17	3.253e-24	2.287e-14	6.171e-27	4.338e-17
0.4	7.097e+17	5.205e-20	9.996e-14	1.014e-22	1.948e-16
0.5	1.056e+18	3.080e-17	1.361e-13	6.045e-20	2.672e-16
0.6	1.124e+18	3.536e-15	2.436e-12	6.901e-18	4.755e-15
0.8	1.746e+18	6.224e-12	2.058e-09	1.184e-14	3.914e-12
1.0	7.982e+17	4.872e-10	9.097e-08	8.980e-13	1.677e-10
1.5	7.711e+17	2.391e-06	1.796e-04	4.023e-09	3.022e-07
2.0	6.354e+17	3.672e-04	1.609e-02	5.678e-07	2.489e-05
3.0	6.518e+16	1.743e-02	3.984e-01	2.365e-05	5.405e-04
4.0	6.478e+12	5.869e-05	9.068e-04	7.261e-08	1.122e-06
TOTALS:	1.155e+19	1.786e-02	4.156e-01	2.429e-05	5.668e-04

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

Page : 1
DOS File: PCCR4.MS5
Run Date: September 2, 2005
Run Time: 3:25:23 PM
Duration: 00:00:19

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 2 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241	3.9500e+000	1.4615e+011	5.8223e-004	2.1542e+001
Ba-137m	2.9231e+006	1.0816e+017	4.3087e+002	1.5942e+007
Ba-139	1.1100e+006	4.1070e+016	1.6361e+002	6.0537e+006
Ba-140	3.0300e+006	1.1211e+017	4.4662e+002	1.6525e+007
Ce-141	6.9800e+004	2.5826e+015	1.0289e+001	3.8067e+005
Ce-143	6.2200e+004	2.3014e+015	9.1683e+000	3.3923e+005
Ce-144	5.8700e+004	2.1719e+015	8.6524e+000	3.2014e+005
Cm-242	1.0300e+003	3.8110e+013	1.5182e-001	5.6174e+003
Cm-244	6.0600e+001	2.2422e+012	8.9324e-003	3.3050e+002
Co-58	1.1500e+003	4.2550e+013	1.6951e-001	6.2719e+003
Co-60	6.1900e+002	2.2903e+013	9.1241e-002	3.3759e+003
Cs-134	4.1100e+006	1.5207e+017	6.0581e+002	2.2415e+007
Cs-136	1.3100e+006	4.8470e+016	1.9309e+002	7.1445e+006
Cs-137	3.0900e+006	1.1433e+017	4.5547e+002	1.6852e+007
I-131	2.3500e+007	8.6950e+017	3.4639e+003	1.2816e+008
I-132	2.8300e+007	1.0471e+018	4.1714e+003	1.5434e+008
I-133	4.6100e+007	1.7057e+018	6.7951e+003	2.5142e+008
I-134	1.1200e+007	4.1440e+017	1.6509e+003	6.1083e+007
I-135	3.7900e+007	1.4023e+018	5.5865e+003	2.0670e+008
Kr-85	1.4800e+006	5.4760e+016	2.1815e+002	8.0716e+006
Kr-85m	1.9700e+007	7.2890e+017	2.9038e+003	1.0744e+008
Kr-87	1.8000e+007	6.6600e+017	2.6532e+003	9.8168e+007
Kr-88	4.5800e+007	1.6946e+018	6.7509e+003	2.4978e+008
La-140	6.9900e+004	2.5863e+015	1.0303e+001	3.8122e+005
La-141	1.9400e+004	7.1780e+014	2.8596e+000	1.0580e+005

For Information Only

DOS File: PCCR4.MS5
Run Date: September 2, 2005
Run Time: 3:25:23 PM
Duration: 00:00:19

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	1.1000e+004	4.0700e+014	1.6214e+000	5.9992e+004
Mo-99	3.8400e+005	1.4208e+016	5.6602e+001	2.0943e+006
Nb-95	2.9800e+004	1.1026e+015	4.3925e+000	1.6252e+005
Nd-147	1.1200e+004	4.1440e+014	1.6509e+000	6.1083e+004
Np-239	8.0400e+005	2.9748e+016	1.1851e+002	4.3849e+006
Pr-143	2.5100e+004	9.2870e+014	3.6997e+000	1.3689e+005
Pr-144	5.7861e+004	2.1408e+015	8.5286e+000	3.1556e+005
Pu-238	1.7700e+002	6.5490e+012	2.6090e-002	9.6532e+002
Pu-239	1.8800e+001	6.9560e+011	2.7711e-003	1.0253e+002
Pu-240	3.0200e+001	1.1174e+012	4.4515e-003	1.6470e+002
Pu-241	7.4500e+003	2.7565e+014	1.0981e+000	4.0631e+004
Rb-86	3.8600e+004	1.4282e+015	5.6896e+000	2.1052e+005
Rh-103m	3.3312e+005	1.2325e+016	4.9102e+001	1.8168e+006
Rh-105	2.1500e+005	7.9550e+015	3.1691e+001	1.1726e+006
Rh-106	1.3300e+005	4.9210e+015	1.9604e+001	7.2535e+005
Ru-103	3.3400e+005	1.2358e+016	4.9232e+001	1.8216e+006
Ru-105	1.6900e+005	6.2530e+015	2.4911e+001	9.2169e+005
Ru-106	1.3300e+005	4.9210e+015	1.9604e+001	7.2535e+005
Sb-127	3.5900e+005	1.3283e+016	5.2917e+001	1.9579e+006
Sb-129	9.7800e+005	3.6186e+016	1.4416e+002	5.3338e+006
Sr-89	1.6000e+006	5.9200e+016	2.3584e+002	8.7261e+006
Sr-90	2.0400e+005	7.5480e+015	3.0070e+001	1.1126e+006
Sr-91	1.7600e+006	6.5120e+016	2.5942e+002	9.5987e+006
Sr-92	1.3000e+006	4.8100e+016	1.9162e+002	7.0899e+006
Tc-99m	3.4700e+005	1.2839e+016	5.1148e+001	1.8925e+006
Te-127	3.6100e+005	1.3357e+016	5.3211e+001	1.9688e+006
Te-127m	6.1700e+004	2.2829e+015	9.0946e+000	3.3650e+005
Te-129	1.1300e+006	4.1810e+016	1.6656e+002	6.1628e+006
Te-129m	2.5800e+005	9.5460e+015	3.8029e+001	1.4071e+006
Te-131m	7.9700e+005	2.9489e+016	1.1748e+002	4.3467e+006
Te-132	5.8800e+006	2.1756e+017	8.6671e+002	3.2068e+007
Xe-133	2.1100e+008	7.8070e+018	3.1101e+004	1.1508e+009
Xe-135	7.6100e+007	2.8157e+018	1.1217e+004	4.1503e+008
Y-90	3.7000e+003	1.3690e+014	5.4538e-001	2.0179e+004
Y-91	2.1100e+004	7.8070e+014	3.1101e+000	1.1508e+005
Y-92	2.1100e+005	7.8070e+015	3.1101e+001	1.1508e+006
Y-93	1.4500e+004	5.3650e+014	2.1373e+000	7.9080e+004
Zr-95	2.9800e+004	1.1026e+015	4.3925e+000	1.6252e+005
Zr-97	2.7200e+004	1.0064e+015	4.0093e+000	1.4834e+005

Buildup

The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

gy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	7.527e+17	0.000e+00	2.896e-18	0.000e+00	2.484e-19

Formatted Information Only
DOS File: PCCR4.MS5
Run Date: September 2, 2005
Run Time: 3:25:23 PM
Duration: 00:00:19

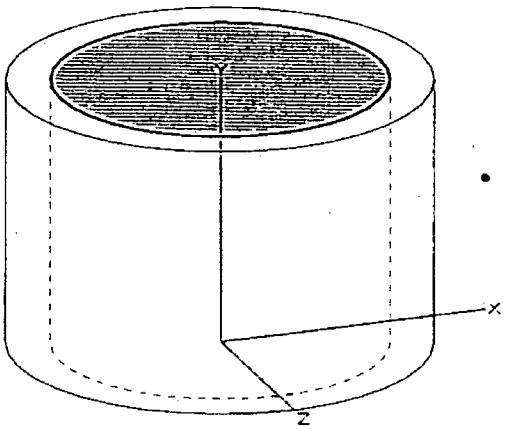
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.508e+15	0.000e+00	1.518e-20	0.000e+00	5.260e-22
0.03	4.179e+18	0.000e+00	5.595e-17	0.000e+00	5.545e-19
0.04	6.397e+15	1.422e-161	2.271e-19	6.289e-164	1.004e-21
0.05	2.860e+16	2.303e-101	3.320e-18	6.134e-104	8.843e-21
0.06	6.842e+15	1.819e-75	5.700e-18	3.614e-78	1.132e-20
0.08	2.892e+18	7.279e-51	5.732e-15	1.152e-53	9.071e-18
0.1	3.599e+16	6.929e-44	3.297e-16	1.060e-46	5.044e-19
0.15	6.707e+17	1.853e-33	3.367e-14	3.051e-36	5.544e-17
0.2	3.237e+18	2.775e-28	3.778e-13	4.898e-31	6.668e-16
0.3	3.052e+17	6.695e-24	4.706e-14	1.270e-26	8.927e-17
0.4	1.274e+18	9.342e-20	1.794e-13	1.820e-22	3.496e-16
0.5	2.000e+18	5.834e-17	2.579e-13	1.145e-19	5.063e-16
0.6	1.986e+18	6.249e-15	4.306e-12	1.220e-17	8.405e-15
0.8	2.546e+18	9.074e-12	3.000e-09	1.726e-14	5.706e-12
1.0	1.338e+18	8.169e-10	1.525e-07	1.506e-12	2.812e-10
1.5	1.402e+18	4.349e-06	3.267e-04	7.317e-09	5.497e-07
2.0	1.276e+18	7.372e-04	3.232e-02	1.140e-06	4.997e-05
3.0	1.064e+17	2.845e-02	6.504e-01	3.860e-05	8.824e-04
4.0	1.068e+13	9.679e-05	1.496e-03	1.197e-07	1.850e-06
TOTALS:	2.405e+19	2.929e-02	6.845e-01	3.987e-05	9.347e-04

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

Page : 1
DOS File: PCCR5.MS5
Run Date: September 2, 2005
Run Time: 3:25:43 PM
Duration: 00:00:19

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

Case Title: PCCR 1
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 4 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241	4.6700e-001	1.7279e+010	6.8836e-005	2.5469e+000
Ba-137m	3.4529e+005	1.2776e+016	5.0896e+001	1.8831e+006
Ba-139	4.7900e+004	1.7723e+015	7.0605e+000	2.6124e+005
Ba-140	3.5700e+005	1.3209e+016	5.2622e+001	1.9470e+006
Ce-141	8.2400e+003	3.0488e+014	1.2146e+000	4.4939e+004
Ce-143	7.0400e+003	2.6048e+014	1.0377e+000	3.8395e+004
Ce-144	6.9400e+003	2.5678e+014	1.0230e+000	3.7849e+004
Cm-242	1.2200e+002	4.5140e+012	1.7983e-002	6.6536e+002
Cm-244	7.1600e+000	2.6492e+011	1.0554e-003	3.9049e+001
Co-58	1.3600e+002	5.0320e+012	2.0046e-002	7.4172e+002
Co-60	7.3200e+001	2.7084e+012	1.0790e-002	3.9922e+002
Cs-134	4.8500e+005	1.7945e+016	7.1489e+001	2.6451e+006
Cs-136	1.5400e+005	5.6980e+015	2.2700e+001	8.3988e+005
Cs-137	3.6500e+005	1.3505e+016	5.3801e+001	1.9906e+006
I-131	4.1500e+006	1.5355e+017	6.1171e+002	2.2633e+007
I-132	3.1500e+006	1.1655e+017	4.6431e+002	1.7179e+007
I-133	7.6600e+006	2.8342e+017	1.1291e+003	4.1776e+007
I-134	4.0900e+005	1.5133e+016	6.0287e+001	2.2306e+006
I-135	5.4600e+006	2.0202e+017	8.0480e+002	2.9778e+007
Kr-85	1.4800e+006	5.4760e+016	2.1815e+002	8.0716e+006
Kr-85m	1.4400e+007	5.3280e+017	2.1226e+003	7.8535e+007
Kr-87	6.0500e+006	2.2385e+017	8.9177e+002	3.2995e+007
Kr-88	2.8100e+007	1.0397e+018	4.1419e+003	1.5325e+008
La-140	2.0100e+004	7.4370e+014	2.9627e+000	1.0962e+005
La-141	1.6100e+003	5.9570e+013	2.3731e-001	8.7806e+003

DOS File: PCCR5.MS5
Run Date: September 2, 2005
Run Time: 3:25:43 PM
Duration: 00:00:19

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	5.2900e+002	1.9573e+013	7.7975e-002	2.8851e+003
Mo-99	4.4500e+004	1.6465e+015	6.5593e+000	2.4269e+005
Nb-95	3.5200e+003	1.3024e+014	5.1885e-001	1.9197e+004
Nd-147	1.3200e+003	4.8840e+013	1.9457e-001	7.1990e+003
Np-239	9.2700e+004	3.4299e+015	1.3664e+001	5.0557e+005
Pr-143	2.9800e+003	1.1026e+014	4.3925e-001	1.6252e+004
Pr-144	6.8408e+003	2.5311e+014	1.0083e+000	3.7308e+004
Pu-238	2.0900e+001	7.7330e+011	3.0807e-003	1.1398e+002
Pu-239	2.2200e+000	8.2140e+010	3.2723e-004	1.2107e+001
Pu-240	3.5700e+000	1.3209e+011	5.2622e-004	1.9470e+001
Pu-241	8.8100e+002	3.2597e+013	1.2986e-001	4.8048e+003
Rb-86	4.5500e+003	1.6835e+014	6.7067e-001	2.4815e+004
Rh-103m	3.9296e+004	1.4540e+015	5.7923e+000	2.1431e+005
Rh-105	2.5100e+004	9.2870e+014	3.6997e+000	1.3689e+005
Rh-106	1.5700e+004	5.8090e+014	2.3142e+000	8.5625e+004
Ru-103	3.9400e+004	1.4578e+015	5.8076e+000	2.1488e+005
Ru-105	1.4600e+004	5.4020e+014	2.1520e+000	7.9625e+004
Ru-106	1.5700e+004	5.8090e+014	2.3142e+000	8.5625e+004
Sb-127	4.1800e+004	1.5466e+015	6.1613e+000	2.2797e+005
Sb-129	8.3900e+004	3.1043e+015	1.2367e+001	4.5757e+005
Sr-89	1.8800e+005	6.9560e+015	2.7711e+001	1.0253e+006
Sr-90	2.4100e+004	8.9170e+014	3.5523e+000	1.3144e+005
Sr-91	1.8000e+005	6.6600e+015	2.6532e+001	9.8168e+005
Sr-92	9.1800e+004	3.3966e+015	1.3531e+001	5.0066e+005
Tc-99m	4.0700e+004	1.5059e+015	5.9992e+000	2.2197e+005
Te-127	4.2600e+004	1.5762e+015	6.2792e+000	2.3233e+005
Te-127m	7.2900e+003	2.6973e+014	1.0745e+000	3.9758e+004
Te-129	1.0800e+005	3.9960e+015	1.5919e+001	5.8901e+005
Te-129m	3.0500e+004	1.1285e+015	4.4957e+000	1.6634e+005
Te-131m	8.9900e+004	3.3263e+015	1.3251e+001	4.9030e+005
Te-132	6.8200e+005	2.5234e+016	1.0053e+002	3.7195e+006
Xe-133	2.0900e+008	7.7330e+018	3.0807e+004	1.1398e+009
Xe-135	6.7100e+007	2.4827e+018	9.8905e+003	3.6595e+008
Y-90	9.4400e+002	3.4928e+013	1.3915e-001	5.1484e+003
Y-91	2.5700e+003	9.5090e+013	3.7882e-001	1.4016e+004
Y-92	5.5400e+004	2.0498e+015	8.1660e+000	3.0214e+005
Y-93	1.4900e+003	5.5130e+013	2.1963e-001	8.1262e+003
Zr-95	3.5200e+003	1.3024e+014	5.1885e-001	1.9197e+004
Zr-97	2.9600e+003	1.0952e+014	4.3630e-001	1.6143e+004

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

gy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.193e+17	0.000e+00	2.383e-18	0.000e+00	2.044e-19

DOS File: PCCR5.MS5
Run Date: September 2, 2005
Run Time: 3:25:43 PM
Duration: 00:00:19

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.931e+14	0.000e+00	1.775e-21	0.000e+00	6.147e-23
0.03	3.889e+18	0.000e+00	5.207e-17	0.000e+00	5.160e-19
0.04	7.290e+14	1.621e-162	2.588e-20	7.168e-165	1.145e-22
0.05	3.318e+15	2.671e-102	3.850e-19	7.115e-105	1.026e-21
0.06	8.022e+14	2.133e-76	6.682e-19	4.237e-79	1.327e-21
0.08	2.843e+18	7.153e-51	5.634e-15	1.132e-53	8.915e-18
0.1	5.812e+15	1.119e-44	5.324e-17	1.712e-47	8.146e-20
0.15	4.469e+17	1.234e-33	2.243e-14	2.033e-36	3.694e-17
0.2	2.540e+18	2.178e-28	2.965e-13	3.843e-31	5.232e-16
0.3	1.053e+17	2.310e-24	1.624e-14	4.381e-27	3.080e-17
0.4	2.991e+17	2.194e-20	4.214e-14	4.275e-23	8.210e-17
0.5	3.118e+17	9.095e-18	4.021e-14	1.785e-20	7.892e-17
0.6	2.903e+17	9.133e-16	6.293e-13	1.783e-18	1.228e-15
0.8	3.769e+17	1.343e-12	4.442e-10	2.555e-15	8.448e-13
1.0	2.270e+17	1.385e-10	2.587e-08	2.554e-13	4.769e-11
1.5	3.328e+17	1.032e-06	7.754e-05	1.736e-09	1.305e-07
2.0	6.669e+17	3.853e-04	1.689e-02	5.959e-07	2.612e-05
3.0	3.936e+16	1.052e-02	2.405e-01	1.428e-05	3.263e-04
4.0	5.138e+11	4.655e-06	7.192e-05	5.759e-09	8.897e-08
TOTALS:	1.300e+19	1.091e-02	2.576e-01	1.488e-05	3.527e-04

MicroShield v5.01 (5.01-00076)
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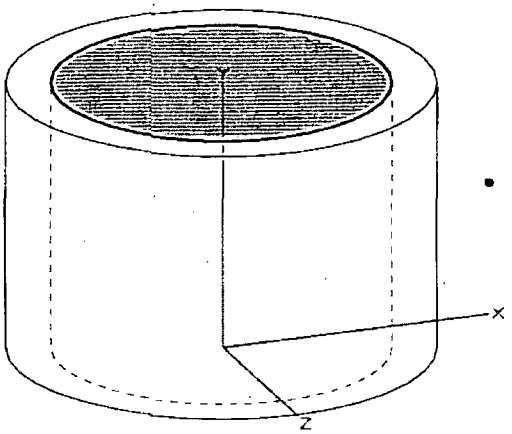
Page : 1
DOS File: PCCR6.MS5
Run Date: September 2, 2005
Run Time: 3:26:02 PM
Duration: 00:00:19

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 8 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241	2.3200e-002	8.5840e+008	3.4197e-006	1.2653e-001
Ba-137m	1.7217e+004	6.3704e+014	2.5378e+000	9.3899e+004
Ba-139	3.1900e+002	1.1803e+013	4.7021e-002	1.7398e+003
Ba-140	1.7600e+004	6.5120e+014	2.5942e+000	9.5987e+004
Ce-141	4.0800e+002	1.5096e+013	6.0139e-002	2.2251e+003
Ce-143	3.2200e+002	1.1914e+013	4.7463e-002	1.7561e+003
Ce-144	3.4500e+002	1.2765e+013	5.0853e-002	1.8816e+003
Cm-242	6.0600e+000	2.2422e+011	8.9324e-004	3.3050e+001
Cm-244	3.5600e-001	1.3172e+010	5.2474e-005	1.9416e+000
Co-58	6.7400e+000	2.4938e+011	9.9348e-004	3.6759e+001
Co-60	3.6400e+000	1.3468e+011	5.3654e-004	1.9852e+001
Cs-134	2.4104e+004	8.9185e+014	3.5529e+000	1.3146e+005
Cs-136	7.5700e+003	2.8009e+014	1.1158e+000	4.1285e+004
Cs-137	1.8200e+004	6.7340e+014	2.6827e+000	9.9259e+004
I-131	1.6800e+006	6.2160e+016	2.4763e+002	9.1624e+006
I-132	4.5400e+005	1.6798e+016	6.6920e+001	2.4760e+006
I-133	2.7500e+006	1.0175e+017	4.0535e+002	1.4998e+007
I-134	7.1000e+003	2.6270e+014	1.0465e+000	3.8722e+004
I-135	1.4700e+006	5.4390e+016	2.1668e+002	8.0171e+006
Kr-85	1.4800e+006	5.4760e+016	2.1815e+002	8.0716e+006
Kr-85m	7.7500e+006	2.8675e+017	1.1423e+003	4.2267e+007
Kr-87	6.8300e+005	2.5271e+016	1.0067e+002	3.7249e+006
Kr-88	1.0600e+007	3.9220e+017	1.5624e+003	5.7810e+007
La-140	2.1100e+003	7.8070e+013	3.1101e-001	1.1508e+004
La-141	3.9600e+001	1.4652e+012	5.8370e-003	2.1597e+002

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Run Time: 3:26:02 PM
Duration: 00:00:19

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	4.3600e+000	1.6132e+011	6.4266e-004	2.3779e+001
Mo-99	2.1200e+003	7.8440e+013	3.1249e-001	1.1562e+004
Nb-95	1.7500e+002	6.4750e+012	2.5795e-002	9.5441e+002
Nd-147	6.4900e+001	2.4013e+012	9.5663e-003	3.5395e+002
Np-239	4.3900e+003	1.6243e+014	6.4709e-001	2.3942e+004
Pr-143	1.5000e+002	5.5500e+012	2.2110e-002	8.1807e+002
Pr-144	3.4007e+002	1.2582e+013	5.0126e-002	1.8547e+003
Pu-238	1.0400e+000	3.8480e+010	1.5330e-004	5.6719e+000
Pu-239	1.1100e-001	4.1070e+009	1.6361e-005	6.0537e-001
Pu-240	1.7800e-001	6.5860e+009	2.6237e-005	9.7078e-001
Pu-241	4.3800e+001	1.6206e+012	6.4561e-003	2.3888e+002
Rb-86	2.2500e+002	8.3250e+012	3.3165e-002	1.2271e+003
Rh-103m	1.9449e+003	7.1960e+013	2.8667e-001	1.0607e+004
Rh-105	1.1900e+003	4.4030e+013	1.7541e-001	6.4900e+003
Rh-106	7.8200e+002	2.8934e+013	1.1527e-001	4.2649e+003
Ru-103	1.9500e+003	7.2150e+013	2.8743e-001	1.0635e+004
Ru-105	3.8900e+002	1.4393e+013	5.7339e-002	2.1215e+003
Ru-106	7.8200e+002	2.8934e+013	1.1527e-001	4.2649e+003
Sb-127	2.0200e+003	7.4740e+013	2.9775e-001	1.1017e+004
Sb-129	2.1900e+003	8.1030e+013	3.2281e-001	1.1944e+004
Sr-89	9.3400e+003	3.4558e+014	1.3767e+000	5.0938e+004
Sr-90	1.2000e+003	4.4400e+013	1.7688e-001	6.5446e+003
Sr-91	6.6700e+003	2.4679e+014	9.8316e-001	3.6377e+004
Sr-92	1.6400e+003	6.0680e+013	2.4174e-001	8.9442e+003
Tc-99m	1.9800e+003	7.3260e+013	2.9185e-001	1.0799e+004
Te-127	2.1000e+003	7.7700e+013	3.0954e-001	1.1453e+004
Te-127m	3.6300e+002	1.3431e+013	5.3506e-002	1.9797e+003
Te-129	3.3800e+003	1.2506e+014	4.9821e-001	1.8434e+004
Te-129m	1.5100e+003	5.5870e+013	2.2257e-001	8.2352e+003
Te-131m	4.0800e+003	1.5096e+014	6.0139e-001	2.2251e+004
Te-132	3.2700e+004	1.2099e+015	4.8200e+000	1.7834e+005
Xe-133	2.0400e+008	7.5480e+018	3.0070e+004	1.1126e+009
Xe-135	4.9900e+007	1.8463e+018	7.3553e+003	2.7214e+008
Y-90	9.5700e+001	3.5409e+012	1.4106e-002	5.2193e+002
Y-91	1.3400e+002	4.9580e+012	1.9752e-002	7.3081e+002
Y-92	2.7300e+002	1.0101e+013	4.0240e-002	1.4889e+003
Y-93	5.6300e+001	2.0831e+012	8.2986e-003	3.0705e+002
Zr-95	1.7500e+002	6.4750e+012	2.5795e-002	9.5441e+002
Zr-97	1.2500e+002	4.6250e+012	1.8425e-002	6.8172e+002

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	5.269e+17	0.000e+00	2.027e-18	0.000e+00	1.739e-19

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For Information Only
DOS File: PCCR6.MS5
Run Date: September 2, 2005
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Duration: 00:00:19

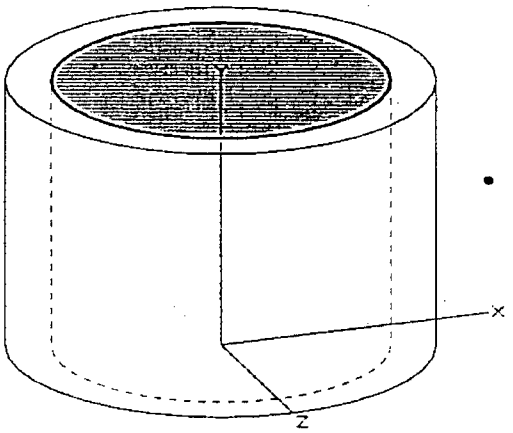
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.424e+13	0.000e+00	8.621e-23	0.000e+00	2.986e-24
0.03	3.727e+18	0.000e+00	4.990e-17	0.000e+00	4.945e-19
0.04	3.510e+13	7.802e-164	1.246e-21	3.451e-166	5.511e-24
0.05	1.591e+14	1.281e-103	1.846e-20	3.411e-106	4.918e-23
0.06	3.924e+13	1.043e-77	3.269e-20	2.073e-80	6.493e-23
0.08	2.772e+18	6.975e-51	5.493e-15	1.104e-53	8.693e-18
0.1	9.516e+14	1.832e-45	8.717e-18	2.803e-48	1.334e-20
0.15	2.344e+17	6.476e-34	1.177e-14	1.066e-36	1.938e-17
0.2	1.771e+18	1.518e-28	2.067e-13	2.679e-31	3.648e-16
0.3	4.842e+16	1.062e-24	7.467e-15	2.015e-27	1.416e-17
0.4	8.932e+16	6.551e-21	1.258e-14	1.276e-23	2.451e-17
0.5	1.020e+17	2.976e-18	1.316e-14	5.842e-21	2.583e-17
0.6	8.833e+16	2.779e-16	1.915e-13	5.424e-19	3.738e-16
0.8	8.991e+16	3.205e-13	1.060e-10	6.095e-16	2.015e-13
1.0	6.170e+16	3.766e-11	7.032e-09	6.941e-14	1.296e-11
1.5	1.043e+17	3.235e-07	2.431e-05	5.444e-10	4.090e-08
2.0	2.458e+17	1.421e-04	6.227e-03	2.197e-07	9.629e-06
3.0	6.563e+15	1.755e-03	4.011e-02	2.381e-06	5.442e-05
4.0	4.235e+09	3.836e-08	5.928e-07	4.746e-11	7.333e-10
TOTALS:	9.869e+18	1.897e-03	4.636e-02	2.601e-06	6.409e-05

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

Page : 1
DOS File: PCCR7.MS5
Date: September 2, 2005
Time: 3:26:22 PM
Duration: 00:00:19

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 16...8 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241	2.8700e-004	1.0619e+007	4.2304e-008	1.5652e-003
Ba-137m	2.1096e+002	7.8054e+012	3.1095e-002	1.1505e+003
Ba-139	7.0100e-002	2.5937e+009	1.0333e-005	3.8231e-001
Ba-140	2.1200e+002	7.8440e+012	3.1249e-002	1.1562e+003
Ce-141	4.9900e+000	1.8463e+011	7.3553e-004	2.7214e+001
Ce-143	3.3500e+000	1.2395e+011	4.9379e-004	1.8270e+001
Ce-144	4.2300e+000	1.5651e+011	6.2350e-004	2.3070e+001
Cm-242	7.4400e-002	2.7528e+009	1.0967e-005	4.0576e-001
Cm-244	4.3700e-003	1.6169e+008	6.4414e-007	2.3833e-002
Co-58	8.2600e-002	3.0562e+009	1.2175e-005	4.5048e-001
Co-60	4.4700e-002	1.6539e+009	6.5888e-006	2.4378e-001
Cs-134	2.9700e+002	1.0989e+013	4.3778e-002	1.6198e+003
Cs-136	9.1500e+001	3.3855e+012	1.3487e-002	4.9902e+002
Cs-137	2.2300e+002	8.2510e+012	3.2870e-002	1.2162e+003
I-131	1.5100e+006	5.5870e+016	2.2257e+002	8.2352e+006
I-132	4.0300e+004	1.4911e+015	5.9402e+000	2.1979e+005
I-133	1.9400e+006	7.1780e+016	2.8596e+002	1.0580e+007
I-134	1.1700e+001	4.3290e+011	1.7246e-003	6.3809e+001
I-135	5.8800e+005	2.1756e+016	8.6671e+001	3.2068e+006
Kr-85	1.4700e+006	5.4390e+016	2.1668e+002	8.0171e+006
Kr-85m	2.2400e+006	8.2880e+016	3.3018e+002	1.2217e+007
Kr-87	8.6900e+003	3.2153e+014	1.2809e+000	4.7393e+004
Kr-88	1.4900e+006	5.5130e+016	2.1963e+002	8.1262e+006
La-140	5.0100e+001	1.8537e+012	7.3847e-003	2.7324e+002
La-141	1.1900e-001	4.4030e+009	1.7541e-005	6.4900e-001

DOS File: PCCR7.MS5
Run Date: September 2, 2005
Run Time: 3:26:22 PM
Duration: 00:00:19

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	1.4700e-003	5.4390e+007	2.1668e-007	8.0171e-003
Mo-99	2.4000e+001	8.8800e+011	3.5376e-003	1.3089e+002
Nb-95	2.1500e+000	7.9550e+010	3.1691e-004	1.1726e+001
Nd-147	7.8100e-001	2.8897e+010	1.1512e-004	4.2594e+000
Np-239	4.8900e+001	1.8093e+012	7.2079e-003	2.6669e+002
Pr-143	1.8700e+000	6.9190e+010	2.7564e-004	1.0199e+001
Pr-144	4.1695e+000	1.5427e+011	6.1459e-004	2.2740e+001
Pu-238	1.2800e-002	4.7360e+008	1.8867e-006	6.9809e-002
Pu-239	1.3600e-003	5.0320e+007	2.0046e-007	7.4172e-003
Pu-240	2.1800e-003	8.0660e+007	3.2133e-007	1.1889e-002
Pu-241	5.3800e-001	1.9906e+010	7.9301e-005	2.9341e+000
Rb-86	2.7300e+000	1.0101e+011	4.0240e-004	1.4889e+001
Rh-103m	2.3837e+001	8.8197e+011	3.5136e-003	1.3000e+002
Rh-105	1.2900e+001	4.7730e+011	1.9015e-003	7.0354e+001
Rh-106	9.6000e+000	3.5520e+011	1.4150e-003	5.2356e+001
Ru-103	2.3900e+001	8.8430e+011	3.5229e-003	1.3035e+002
Ru-105	1.3700e+000	5.0690e+010	2.0194e-004	7.4717e+000
Ru-106	9.6000e+000	3.5520e+011	1.4150e-003	5.2356e+001
Sb-127	2.3400e+001	8.6580e+011	3.4492e-003	1.2762e+002
Sb-129	7.4700e+000	2.7639e+011	1.1011e-003	4.0740e+001
Sr-89	1.1400e+002	4.2180e+012	1.6804e-002	6.2173e+002
Sr-90	1.4700e+001	5.4390e+011	2.1668e-003	8.0171e+001
Sr-91	4.5800e+001	1.6946e+012	6.7509e-003	2.4978e+002
Sr-92	2.6100e+000	9.6570e+010	3.8471e-004	1.4234e+001
Tc-99m	2.3300e+001	8.6210e+011	3.4344e-003	1.2707e+002
Te-127	2.5200e+001	9.3240e+011	3.7145e-003	1.3744e+002
Te-127m	4.4600e+000	1.6502e+011	6.5740e-004	2.4324e+001
Te-129	2.5400e+001	9.3980e+011	3.7440e-003	1.3853e+002
Te-129m	1.8500e+001	6.8450e+011	2.7269e-003	1.0090e+002
Te-131m	4.1700e+001	1.5429e+012	6.1466e-003	2.2742e+002
Te-132	3.7500e+002	1.3875e+013	5.5275e-002	2.0452e+003
Xe-133	1.9500e+008	7.2150e+018	2.8743e+004	1.0635e+009
Xe-135	2.7400e+007	1.0138e+018	4.0388e+003	1.4943e+008
Y-90	2.3000e+000	8.5100e+010	3.3902e-004	1.2544e+001
Y-91	1.7400e+000	6.4380e+010	2.5648e-004	9.4896e+000
Y-92	1.2500e+001	4.6250e+011	1.8425e-003	6.8172e+001
Y-93	4.0000e-001	1.4800e+010	5.8960e-005	2.1815e+000
Zr-95	2.1400e+000	7.9180e+010	3.1544e-004	1.1671e+001
Zr-97	1.1100e+000	4.1070e+010	1.6361e-004	6.0537e+000

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

gy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.598e+17	0.000e+00	1.769e-18	0.000e+00	1.518e-19

DOS File: PCCR7.MS5
Run Date: September 2, 2005
Run Time: 3:26:22 PM
Duration: 00:00:19

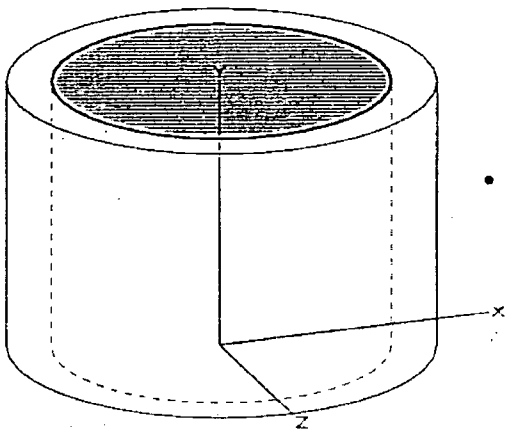
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.687e+11	0.000e+00	1.021e-24	0.000e+00	3.537e-26
0.03	3.517e+18	0.000e+00	4.708e-17	0.000e+00	4.666e-19
0.04	4.154e+11	9.236e-166	1.475e-23	4.085e-168	6.523e-26
0.05	1.824e+12	1.469e-105	2.117e-22	3.913e-108	5.641e-25
0.06	4.697e+11	1.249e-79	3.913e-22	2.481e-82	7.772e-25
0.08	2.649e+18	6.667e-51	5.251e-15	1.055e-53	8.309e-18
0.1	1.107e+14	2.131e-46	1.014e-18	3.261e-49	1.552e-21
0.15	6.728e+16	1.859e-34	3.377e-15	3.061e-37	5.562e-18
0.2	9.316e+17	7.988e-29	1.087e-13	1.410e-31	1.919e-16
0.3	1.662e+16	3.645e-25	2.562e-15	6.914e-28	4.860e-18
0.4	5.459e+16	4.004e-21	7.689e-15	7.801e-24	1.498e-17
0.5	6.651e+16	1.940e-18	8.578e-15	3.809e-21	1.684e-17
0.6	3.873e+16	1.219e-16	8.397e-14	2.379e-19	1.639e-16
0.8	1.772e+16	6.314e-14	2.088e-11	1.201e-16	3.971e-14
1.0	1.552e+16	9.471e-12	1.768e-09	1.746e-14	3.260e-12
1.5	2.343e+16	7.265e-08	5.459e-06	1.222e-10	9.184e-09
2.0	3.597e+16	2.079e-05	9.111e-04	3.214e-08	1.409e-06
3.0	4.704e+14	1.258e-04	2.875e-03	1.707e-07	3.901e-06
4.0	1.428e+06	1.293e-11	1.999e-10	1.600e-14	2.472e-13
TOTALS:	7.894e+18	1.466e-04	3.792e-03	2.029e-07	5.319e-06

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

Page : 1
DOS File: PCCR8.MS5
Run Date: September 2, 2005
Run Time: 3:26:42 PM
Duration: 00:00:19

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 24 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241	4.4800e-006	1.6576e+005	6.6035e-010	2.4433e-005
Ba-137m	3.2921e+000	1.2181e+011	4.8525e-004	1.7954e+001
Ba-139	1.9600e-005	7.2520e+005	2.8890e-009	1.0689e-004
Ba-140	3.2500e+000	1.2025e+011	4.7905e-004	1.7725e+001
Ce-141	7.7200e-002	2.8564e+009	1.1379e-005	4.2103e-001
Ce-143	4.4100e-002	1.6317e+009	6.5003e-006	2.4051e-001
Ce-144	6.6000e-002	2.4420e+009	9.7284e-006	3.5995e-001
Cm-242	1.1600e-003	4.2920e+007	1.7098e-007	6.3264e-003
Cm-244	6.8300e-005	2.5271e+006	1.0067e-008	3.7249e-004
Co-58	1.2800e-003	4.7360e+007	1.8867e-007	6.9809e-003
Co-60	6.9800e-004	2.5826e+007	1.0289e-007	3.8067e-003
Cs-134	4.6200e+000	1.7094e+011	6.8099e-004	2.5197e+001
Cs-136	1.4000e+000	5.1800e+010	2.0636e-004	7.6353e+000
Cs-137	3.4800e+000	1.2876e+011	5.1295e-004	1.8979e+001
I-131	1.4600e+006	5.4020e+016	2.1520e+002	7.9625e+006
I-132	3.6400e+003	1.3468e+014	5.3654e-001	1.9852e+004
I-133	1.4800e+006	5.4760e+016	2.1815e+002	8.0716e+006
I-134	2.0900e-002	7.7330e+008	3.0807e-006	1.1398e-001
I-135	2.5300e+005	9.3610e+015	3.7292e+001	1.3798e+006
Kr-85	1.4700e+006	5.4390e+016	2.1668e+002	8.0171e+006
Kr-85m	6.4800e+005	2.3976e+016	9.5515e+001	3.5341e+006
Kr-87	1.1100e+002	4.1070e+012	1.6361e-002	6.0537e+002
Kr-88	2.1100e+005	7.8070e+015	3.1101e+001	1.1508e+006
La-140	1.1100e+000	4.1070e+010	1.6361e-004	6.0537e+000
La-141	4.5200e-004	1.6724e+007	6.6625e-008	2.4651e-003

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	6.2800e-007	2.3236e+004	9.2567e-011	3.4250e-006
Mo-99	3.4400e-001	1.2728e+010	5.0706e-005	1.8761e+000
Nb-95	3.3600e-002	1.2432e+009	4.9526e-006	1.8325e-001
Nd-147	1.1900e-002	4.4030e+008	1.7541e-006	6.4900e-002
Np-239	6.9200e-001	2.5604e+010	1.0200e-004	3.7740e+000
Pr-143	2.9500e-002	1.0915e+009	4.3483e-006	1.6089e-001
Pr-144	6.5056e-002	2.4071e+009	9.5893e-006	3.5480e-001
Pu-238	1.9900e-004	7.3630e+006	2.9333e-008	1.0853e-003
Pu-239	2.1200e-005	7.8440e+005	3.1249e-009	1.1562e-004
Pu-240	3.4100e-005	1.2617e+006	5.0263e-009	1.8597e-004
Pu-241	8.4000e-003	3.1080e+008	1.2382e-006	4.5812e-002
Rb-86	4.2100e-002	1.5577e+009	6.2055e-006	2.2960e-001
Rh-103m	3.6903e-001	1.3654e+010	5.4395e-005	2.0126e+000
Rh-105	1.7400e-001	6.4380e+009	2.5648e-005	9.4896e-001
Rh-106	1.5000e-001	5.5500e+009	2.2110e-005	8.1807e-001
Ru-103	3.7000e-001	1.3690e+010	5.4538e-005	2.0179e+000
Ru-105	6.1400e-003	2.2718e+008	9.0504e-007	3.3486e-002
Ru-106	1.5000e-001	5.5500e+009	2.2110e-005	8.1807e-001
Sb-127	3.4300e-001	1.2691e+010	5.0558e-005	1.8707e+000
Sb-129	3.2300e-002	1.1951e+009	4.7610e-006	1.7616e-001
Sr-89	1.7800e+000	6.5860e+010	2.6237e-004	9.7078e+000
Sr-90	2.2900e-001	8.4730e+009	3.3755e-005	1.2489e+000
Sr-91	3.9800e-001	1.4726e+010	5.8665e-005	2.1706e+000
Sr-92	5.2600e-003	1.9462e+008	7.7532e-007	2.8687e-002
Tc-99m	3.4400e-001	1.2728e+010	5.0706e-005	1.8761e+000
Te-127	3.8300e-001	1.4171e+010	5.6454e-005	2.0888e+000
Te-127m	6.9500e-002	2.5715e+009	1.0244e-005	3.7904e-001
Te-129	2.9400e-001	1.0878e+010	4.3336e-005	1.6034e+000
Te-129m	2.8700e-001	1.0619e+010	4.2304e-005	1.5652e+000
Te-131m	5.4000e-001	1.9980e+010	7.9596e-005	2.9450e+000
Te-132	5.4500e+000	2.0165e+011	8.0333e-004	2.9723e+001
Xe-133	1.8600e+008	6.8820e+018	2.7416e+004	1.0144e+009
Xe-135	1.5000e+007	5.5500e+017	2.2110e+003	8.1807e+007
Y-90	5.2100e-002	1.9277e+009	7.6795e-006	2.8414e-001
Y-91	2.7900e-002	1.0323e+009	4.1125e-006	1.5216e-001
Y-92	5.2300e-002	1.9351e+009	7.7090e-006	2.8523e-001
Y-93	3.6000e-003	1.3320e+008	5.3064e-007	1.9634e-002
Zr-95	3.3200e-002	1.2284e+009	4.8937e-006	1.8107e-001
Zr-97	1.2400e-002	4.5880e+008	1.8278e-006	6.7627e-002

Buildup

The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.288e+17	0.000e+00	1.650e-18	0.000e+00	1.415e-19

DOS File: PCCR8.MS5
Run Date: September 2, 2005
Run Time: 3:26:42 PM
Duration: 00:00:19

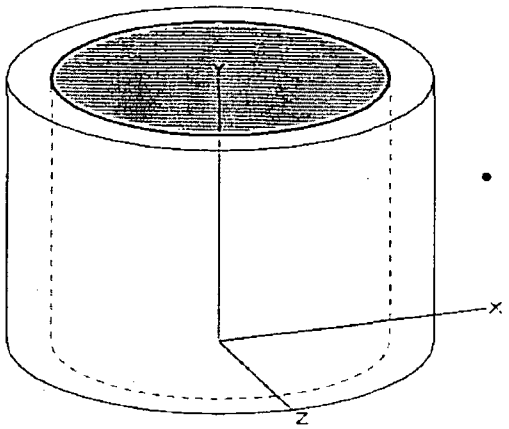
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.527e+09	0.000e+00	1.530e-26	0.000e+00	5.299e-28
0.03	3.332e+18	0.000e+00	4.461e-17	0.000e+00	4.421e-19
0.04	6.272e+09	1.394e-167	2.227e-25	6.166e-170	9.847e-28
0.05	2.652e+10	2.135e-107	3.078e-24	5.687e-110	8.198e-27
0.06	7.125e+09	1.895e-81	5.936e-24	3.763e-84	1.179e-26
0.08	2.527e+18	6.360e-51	5.008e-15	1.006e-53	7.926e-18
0.1	1.543e+13	2.969e-47	1.413e-19	4.543e-50	2.162e-22
0.15	1.997e+16	5.515e-35	1.002e-15	9.082e-38	1.650e-18
0.2	5.062e+17	4.340e-29	5.909e-14	7.661e-32	1.043e-16
0.3	7.557e+15	1.658e-25	1.165e-15	3.145e-28	2.210e-18
0.4	4.809e+16	3.527e-21	6.773e-15	6.872e-24	1.320e-17
0.5	4.981e+16	1.453e-18	6.424e-15	2.852e-21	1.261e-17
0.6	2.218e+16	6.978e-17	4.808e-14	1.362e-19	9.385e-17
0.8	7.224e+15	2.575e-14	8.514e-12	4.898e-17	1.619e-14
1.0	5.842e+15	3.566e-12	6.658e-10	6.572e-15	1.227e-12
1.5	7.810e+15	2.422e-08	1.820e-06	4.075e-11	3.061e-09
2.0	5.781e+15	3.340e-06	1.464e-04	5.166e-09	2.264e-07
3.0	6.081e+13	1.626e-05	3.717e-04	2.206e-08	5.043e-07
4.0	6.099e+02	5.526e-15	8.538e-14	6.836e-18	1.056e-16
TOTALS:	6.969e+18	1.963e-05	5.199e-04	2.727e-08	7.338e-07

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

Page : 1
DOS File: PCCR9.MS5
Run Date: September 2, 2005
Run Time: 3:27:02 PM
Duration: 00:00:19

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 48 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241	4.0800e-007	1.5096e+004	6.0139e-011	2.2251e-006
Ba-137m	2.9704e-001	1.0991e+010	4.3784e-005	1.6200e+000
Ba-139				
Ba-140	2.7800e-001	1.0286e+010	4.0977e-005	1.5162e+000
Ce-141	6.8300e-003	2.5271e+008	1.0067e-006	3.7249e-002
Ce-143	2.4100e-003	8.9170e+007	3.5523e-007	1.3144e-002
Ce-144	5.9400e-003	2.1978e+008	8.7556e-007	3.2396e-002
Cm-242	1.0400e-004	3.8480e+006	1.5330e-008	5.6719e-004
Cm-244	6.1600e-006	2.2792e+005	9.0798e-010	3.3595e-005
Co-58	1.1500e-004	4.2550e+006	1.6951e-008	6.2719e-004
Co-60	6.3000e-005	2.3310e+006	9.2862e-009	3.4359e-004
Cs-134	4.1700e-001	1.5429e+010	6.1466e-005	2.2742e+000
Cs-136	1.2000e-001	4.4400e+009	1.7688e-005	6.5446e-001
Cs-137	3.1400e-001	1.1618e+010	4.6284e-005	1.7125e+000
I-131	1.3300e+006	4.9210e+016	1.9604e+002	7.2535e+006
I-132	3.2900e+000	1.2173e+011	4.8495e-004	1.7943e+001
I-133	6.6300e+005	2.4531e+016	9.7726e+001	3.6159e+006
I-134	1.1900e-010	4.4030e+000	1.7541e-014	6.4900e-010
I-135	2.0300e+004	7.5110e+014	2.9922e+000	1.1071e+005
Kr-85	1.4600e+006	5.4020e+016	2.1520e+002	7.9625e+006
Kr-85m	1.5700e+004	5.8090e+014	2.3142e+000	8.5625e+004
Kr-87	2.2900e-004	8.4730e+006	3.3755e-008	1.2489e-003
Kr-88	6.0100e+002	2.2237e+013	8.8587e-002	3.2777e+003
La-140	1.6300e-001	6.0310e+009	2.4026e-005	8.8897e-001
La-141	5.9200e-007	2.1904e+004	8.7261e-011	3.2286e-006

For Information Only

DOS File: PCCR9.MS5
Run Date: September 2, 2005
Run Time: 3:27:02 PM
Duration: 00:00:19

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	2.4100e-002	8.9170e+008	3.5523e-006	1.3144e-001
Nb-95	3.0300e-003	1.1211e+008	4.4662e-007	1.6525e-002
Nd-147	1.0100e-003	3.7370e+007	1.4887e-007	5.5083e-003
Np-239	4.6500e-002	1.7205e+009	6.8541e-006	2.5360e-001
Pr-143	2.6900e-003	9.9530e+007	3.9651e-007	1.4671e-002
Pr-144	5.8551e-003	2.1664e+008	8.6303e-007	3.1932e-002
Pu-238	1.8000e-005	6.6600e+005	2.6532e-009	9.8168e-005
Pu-239	1.9200e-006	7.1040e+004	2.8301e-010	1.0471e-005
Pu-240	3.0700e-006	1.1359e+005	4.5252e-010	1.6743e-005
Pu-241	7.5800e-004	2.8046e+007	1.1173e-007	4.1340e-003
Rb-86	3.6600e-003	1.3542e+008	5.3948e-007	1.9961e-002
Rh-103m	3.2714e-002	1.2104e+009	4.8220e-006	1.7841e-001
Rh-105	9.8700e-003	3.6519e+008	1.4548e-006	5.3829e-002
Rh-106	1.3500e-002	4.9950e+008	1.9899e-006	7.3626e-002
Ru-103	3.2800e-002	1.2136e+009	4.8347e-006	1.7888e-001
Ru-105	1.3100e-005	4.8470e+005	1.9309e-009	7.1445e-005
Ru-106	1.3500e-002	4.9950e+008	1.9899e-006	7.3626e-002
Sb-127	2.5900e-002	9.5830e+008	3.8177e-006	1.4125e-001
Sb-129	6.2000e-005	2.2940e+006	9.1388e-009	3.3814e-004
Sr-89	1.5800e-001	5.8460e+009	2.3289e-005	8.6170e-001
Sr-90	2.0700e-002	7.6590e+008	3.0512e-006	1.1289e-001
Sr-91	6.2400e-003	2.3088e+008	9.1978e-007	3.4032e-002
Sr-92	1.0200e-006	3.7740e+004	1.5035e-010	5.5629e-006
Tc-99m	2.4700e-002	9.1390e+008	3.6408e-006	1.3471e-001
Te-127	3.0700e-002	1.1359e+009	4.5252e-006	1.6743e-001
Te-127m	6.2700e-003	2.3199e+008	9.2420e-007	3.4195e-002
Te-129	2.2000e-002	8.1400e+008	3.2428e-006	1.1998e-001
Te-129m	2.5400e-002	9.3980e+008	3.7440e-006	1.3853e-001
Te-131m	2.8000e-002	1.0360e+009	4.1272e-006	1.5271e-001
Te-132	3.9800e-001	1.4726e+010	5.8665e-005	2.1706e+000
Xe-133	1.6200e+008	5.9940e+018	2.3879e+004	8.8351e+008
Xe-135	2.4400e+006	9.0280e+016	3.5966e+002	1.3307e+007
Y-90	8.3900e-003	3.1043e+008	1.2367e-006	4.5757e-002
Y-91	2.5800e-003	9.5460e+007	3.8029e-007	1.4071e-002
Y-92	5.4800e-005	2.0276e+006	8.0775e-009	2.9887e-004
Y-93	6.2600e-005	2.3162e+006	9.2272e-009	3.4141e-004
Zr-95	2.9700e-003	1.0989e+008	4.3778e-007	1.6198e-002
Zr-97	4.1900e-004	1.5503e+007	6.1761e-008	2.2851e-003

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.691e+17	0.000e+00	1.420e-18	0.000e+00	1.218e-19

DOS File: PCCR9.MS5
Run Date: September 2, 2005
Run Time: 3:27:02 PM
Duration: 00:00:19

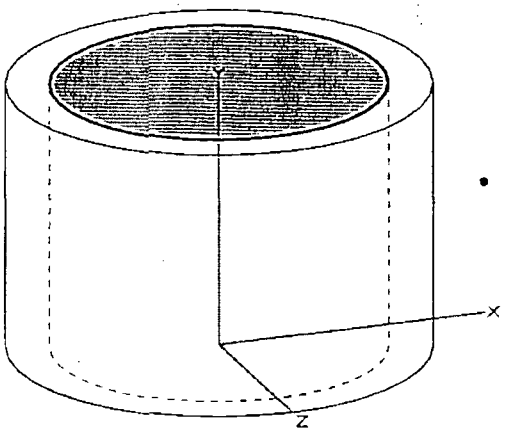
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.000e+08	0.000e+00	1.211e-27	0.000e+00	4.194e-29
0.03	2.882e+18	0.000e+00	3.859e-17	0.000e+00	3.824e-19
0.04	5.232e+08	1.163e-168	1.857e-26	5.144e-171	8.215e-29
0.05	1.937e+09	1.559e-108	2.248e-25	4.154e-111	5.989e-28
0.06	5.977e+08	1.589e-82	4.979e-25	3.157e-85	9.890e-28
0.08	2.201e+18	5.539e-51	4.362e-15	8.766e-54	6.903e-18
0.1	4.579e+10	8.814e-50	4.194e-22	1.349e-52	6.417e-25
0.15	7.003e+14	1.934e-36	3.515e-17	3.185e-39	5.788e-20
0.2	8.558e+16	7.338e-30	9.989e-15	1.295e-32	1.763e-17
0.3	3.465e+15	7.600e-26	5.342e-16	1.442e-28	1.013e-18
0.4	4.064e+16	2.981e-21	5.725e-15	5.808e-24	1.115e-17
0.5	2.224e+16	6.487e-19	2.868e-15	1.273e-21	5.629e-18
0.6	6.780e+15	2.133e-17	1.470e-14	4.163e-20	2.869e-17
0.8	2.864e+15	1.021e-14	3.375e-12	1.941e-17	6.419e-15
1.0	9.002e+14	5.494e-13	1.026e-10	1.013e-15	1.891e-13
1.5	1.019e+15	3.159e-09	2.373e-07	5.315e-12	3.993e-10
2.0	9.617e+13	5.557e-08	2.436e-06	8.593e-11	3.767e-09
3.0	1.718e+11	4.594e-08	1.050e-06	6.232e-11	1.425e-09
TOTALS:	5.617e+18	1.047e-07	3.723e-06	1.536e-10	5.591e-09

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

Page : 1
DOS File: PCCR10.MS5
Run Date: September 2, 2005
Run Time: 3:23:43 PM
Duration: 00:00:18

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 96 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241	3.3800e-009	1.2506e+002	4.9821e-013	1.8434e-008
Ba-137m	2.4218e-003	8.9605e+007	3.5697e-007	1.3208e-002
Ba-139				
Ba-140				
Ce-141	5.3300e-005	1.9721e+006	7.8564e-009	2.9069e-004
Ce-143	7.1600e-006	2.6492e+005	1.0554e-009	3.9049e-005
Ce-144	4.8200e-006	1.7834e+005	7.1047e-010	2.6287e-005
Cm-242	8.4200e-007	3.1154e+004	1.2411e-010	4.5921e-006
Cm-244	5.0200e-008	1.8574e+003	7.3995e-012	2.7378e-007
Co-58	9.1800e-007	3.3966e+004	1.3531e-010	5.0066e-006
Co-60	5.1300e-007	1.8981e+004	7.5616e-011	2.7978e-006
Cs-134	3.3900e-003	1.2543e+008	4.9969e-007	1.8488e-002
Cs-136	8.8000e-004	3.2560e+007	1.2971e-007	4.7993e-003
Cs-137	2.5600e-003	9.4720e+007	3.7734e-007	1.3962e-002
I-131	1.1100e+006	4.1070e+016	1.6361e+002	6.0537e+006
I-132	3.6600e-003	1.3542e+008	5.3948e-007	1.9961e-002
I-133	1.3300e+005	4.9210e+015	1.9604e+001	7.2535e+005
I-134				
I-135	1.3100e+002	4.8470e+012	1.9309e-002	7.1445e+002
Kr-85	1.4400e+006	5.3280e+016	2.1226e+002	7.8535e+006
Kr-85m	9.2700e+000	3.4299e+011	1.3664e-003	5.0557e+001
Kr-87				
Kr-88	4.8600e-003	1.7982e+008	7.1636e-007	2.6505e-002
La-140	2.0300e-003	7.5110e+007	2.9922e-007	1.1071e-002
La-141	1.7900e-003	6.6230e+007	2.6385e-007	9.7623e-003

DOS File: PCCR10.MS5
Run Date: September 2, 2005
Run Time: 3:23:43 PM
Duration: 00:00:18

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	1.1900e-004	4.4030e+006	1.7541e-008	6.4900e-004
Nb-95	2.4700e-005	9.1390e+005	3.6408e-009	1.3471e-004
Nd-147	7.2600e-006	2.6862e+005	1.0701e-009	3.9595e-005
Np-239	2.1000e-004	7.7700e+006	3.0954e-008	1.1453e-003
Pr-143	2.1000e-005	7.7700e+005	3.0954e-009	1.1453e-004
Pr-144	4.7511e-006	1.7579e+005	7.0031e-010	2.5911e-005
Pu-238	1.4700e-007	5.4390e+003	2.1668e-011	8.0171e-007
Pu-239	1.5700e-008	5.8090e+002	2.3142e-012	8.5625e-008
Pu-240	2.5100e-008	9.2870e+002	3.6997e-012	1.3689e-007
Pu-241	6.1800e-006	2.2866e+005	9.1093e-010	3.3704e-005
Rb-86	2.7700e-005	1.0249e+006	4.0830e-009	1.5107e-004
Rh-103m	2.5732e-004	9.5209e+006	3.7929e-008	1.4034e-003
Rh-105	3.1400e-005	1.1618e+006	4.6284e-009	1.7125e-004
Rh-106	1.1000e-004	4.0700e+006	1.6214e-008	5.9992e-004
Ru-103	2.5800e-004	9.5460e+006	3.8029e-008	1.4071e-003
Ru-105	5.9300e-011	2.1941e+000	8.7408e-015	3.2341e-010
Ru-106	1.1000e-004	4.0700e+006	1.6214e-008	5.9992e-004
Sb-127	1.4700e-004	5.4390e+006	2.1668e-008	8.0171e-004
Sb-129	2.2800e-010	8.4360e+000	3.3607e-014	1.2435e-009
Sr-89	1.2500e-003	4.6250e+007	1.8425e-007	6.8172e-003
Sr-90	1.6900e-004	6.2530e+006	2.4911e-008	9.2169e-004
Sr-91	1.5300e-006	5.6610e+004	2.2552e-010	8.3443e-006
Sr-92				
Tc-99m	1.2200e-004	4.5140e+006	1.7983e-008	6.6536e-004
Te-127	1.9100e-004	7.0670e+006	2.8153e-008	1.0417e-003
Te-127m	5.0800e-005	1.8796e+006	7.4879e-009	2.7705e-004
Te-129	1.7200e-004	6.3640e+006	2.5353e-008	9.3805e-004
Te-129m	1.9800e-004	7.3260e+006	2.9185e-008	1.0799e-003
Te-131m	7.5300e-005	2.7861e+006	1.1099e-008	4.1067e-004
Te-132	2.1200e-003	7.8440e+007	3.1249e-007	1.1562e-002
Xe-133	1.2300e+008	4.5510e+018	1.8130e+004	6.7082e+008
Xe-135	6.3000e+004	2.3310e+015	9.2862e+000	3.4359e+005
Y-90	1.0900e-004	4.0330e+006	1.6067e-008	5.9446e-004
Y-91	2.0600e-005	7.6220e+005	3.0364e-009	1.1235e-004
Y-92	3.9400e-011	1.4578e+000	5.8076e-015	2.1488e-010
Y-93	1.8900e-008	6.9930e+002	2.7859e-012	1.0308e-007
Zr-95	2.3700e-005	8.7690e+005	3.4934e-009	1.2925e-004
Zr-97	4.7700e-007	1.7649e+004	7.0310e-011	2.6015e-006

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.798e+17	0.000e+00	1.076e-18	0.000e+00	9.233e-20

DOS File: PCCR10.MS5
Run Date: September 2, 2005
Run Time: 3:23:43 PM
Duration: 00:00:18

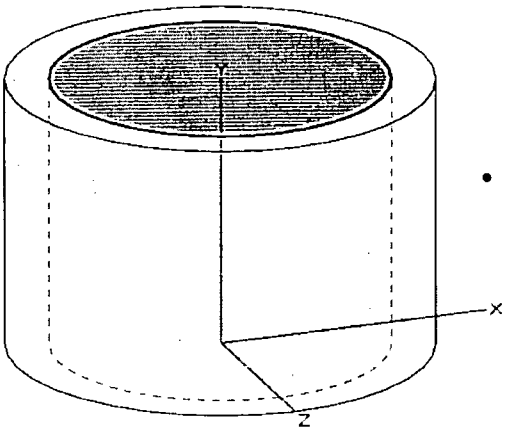
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.289e+06	0.000e+00	7.804e-30	0.000e+00	2.703e-31
0.03	2.185e+18	0.000e+00	2.925e-17	0.000e+00	2.899e-19
0.04	3.437e+06	7.641e-171	1.220e-28	3.379e-173	5.397e-31
0.05	1.033e+07	8.315e-111	1.199e-27	2.215e-113	3.193e-30
0.06	4.260e+06	1.133e-84	3.549e-27	2.250e-87	7.049e-30
0.08	1.671e+18	4.206e-51	3.312e-15	6.656e-54	5.242e-18
0.1	9.522e+06	1.833e-53	8.723e-26	2.804e-56	1.334e-28
0.15	6.986e+12	1.930e-38	3.507e-19	3.178e-41	5.775e-22
0.2	5.444e+15	4.668e-31	6.354e-16	8.238e-34	1.122e-18
0.3	2.712e+15	5.949e-26	4.182e-16	1.128e-28	7.932e-19
0.4	3.338e+16	2.448e-21	4.701e-15	4.770e-24	9.160e-18
0.5	4.747e+15	1.385e-19	6.121e-16	2.718e-22	1.202e-18
0.6	3.203e+15	1.008e-17	6.943e-15	1.967e-20	1.355e-17
0.8	1.125e+15	4.010e-15	1.326e-12	7.627e-18	2.522e-15
1.0	1.198e+14	7.314e-14	1.366e-11	1.348e-16	2.517e-14
1.5	1.246e+14	3.864e-10	2.903e-08	6.502e-13	4.885e-11
2.0	5.334e+11	3.082e-10	1.351e-08	4.767e-13	2.089e-11
3.0	4.062e+06	1.086e-12	2.483e-11	1.474e-15	3.368e-14
TOTALS:	4.187e+18	6.958e-10	4.258e-08	1.128e-12	6.980e-11

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

Page : 1
DOS File: PCCR11.MS5
Run Date: September 2, 2005
Run Time: 3:24:02 PM
Duration: 00:00:18

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 240HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241	1.9200e-015	7.1040e-005	2.8301e-019	1.0471e-014
Ba-137m	1.3149e-009	4.8653e+001	1.9382e-013	7.1714e-009
Ba-139				
Ba-140	7.9300e-010	2.9341e+001	1.1689e-013	4.3249e-009
Ce-141	2.5400e-011	9.3980e-001	3.7440e-015	1.3853e-010
Ce-143				
Ce-144	2.5700e-011	9.5090e-001	3.7882e-015	1.4016e-010
Cm-242	4.4400e-013	1.6428e-002	6.5446e-017	2.4215e-012
Cm-244	2.7100e-014	1.0027e-003	3.9945e-018	1.4780e-013
Co-58	4.6800e-014	1.7316e-003	6.8983e-018	2.5524e-013
Co-60	2.7700e-013	1.0249e-002	4.0830e-017	1.5107e-012
Cs-134	1.8300e-009	6.7710e+001	2.6974e-013	9.9804e-009
Cs-136	3.4700e-010	1.2839e+001	5.1148e-014	1.8925e-009
Cs-137	1.3900e-009	5.1430e+001	2.0489e-013	7.5808e-009
I-131	6.4200e+005	2.3754e+016	9.4631e+001	3.5013e+006
I-132	5.5300e-010	2.0461e+001	8.1512e-014	3.0159e-009
I-133	1.0600e+003	3.9220e+013	1.5624e-001	5.7810e+003
I-134				
I-135	3.5200e-005	1.3024e+006	5.1885e-009	1.9197e-004
Kr-85	1.4000e+006	5.1800e+016	2.0636e+002	7.6353e+006
Kr-85m	1.9000e-009	7.0300e+001	2.8006e-013	1.0362e-008
Kr-87				
Kr-88				
La-140	8.9500e-010	3.3115e+001	1.3192e-013	4.8811e-009
La-141				

DOS File: PCCR11.MS5
Run Date: September 2, 2005
Run Time: 3:24:02 PM
Duration: 00:00:18

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	1.4200e-011	5.2540e-001	2.0931e-015	7.7444e-011
Nb-95	1.3200e-011	4.8840e-001	1.9457e-015	7.1990e-011
Nd-147	2.6900e-012	9.9530e-002	3.9651e-016	1.4671e-011
Np-239	1.9500e-011	7.2150e-001	2.8743e-015	1.0635e-010
Pr-143	8.6500e-012	3.2005e-001	1.2750e-015	4.7175e-011
Pr-144	2.5332e-011	9.3730e-001	3.7340e-015	1.3816e-010
Pu-238	7.9500e-014	2.9415e-003	1.1718e-017	4.3358e-013
Pu-239	8.5200e-015	3.1524e-004	1.2558e-018	4.6466e-014
Pu-240	1.3600e-014	5.0320e-004	2.0046e-018	7.4172e-014
Pu-241	3.3400e-012	1.2358e-001	4.9232e-016	1.8216e-011
Rb-86	1.2000e-011	4.4400e-001	1.7688e-015	6.5446e-011
Rh-103m	1.2567e-010	4.6497e+000	1.8524e-014	6.8537e-010
Rh-105				
Rh-106	5.8600e-011	2.1682e+000	8.6376e-015	3.1959e-010
Ru-103	1.2600e-010	4.6620e+000	1.8572e-014	6.8718e-010
Ru-105				
Ru-106	5.8600e-011	2.1682e+000	8.6376e-015	3.1959e-010
Sb-127	2.7000e-011	9.9900e-001	3.9798e-015	1.4725e-010
Sb-129				
Sr-89	6.2500e-010	2.3125e+001	9.2125e-014	3.4086e-009
Sr-90	9.1300e-011	3.3781e+000	1.3458e-014	4.9793e-010
Sr-91				
Sr-92				
Tc-99m	1.4500e-011	5.3650e-001	2.1373e-015	7.9080e-011
Te-127	5.2900e-011	1.9573e+000	7.7975e-015	2.8851e-010
Te-127m	2.6800e-011	9.9160e-001	3.9503e-015	1.4616e-010
Te-129	8.2100e-011	3.0377e+000	1.2102e-014	4.4776e-010
Te-129m	9.4900e-011	3.5113e+000	1.3988e-014	5.1757e-010
Te-131m				
Te-132	3.2000e-010	1.1840e+001	4.7168e-014	1.7452e-009
Xe-133	5.4200e+007	2.0054e+018	7.9891e+003	2.9560e+008
Xe-135	1.0500e+000	3.8850e+010	1.5477e-004	5.7265e+000
Y-90	8.4900e-011	3.1413e+000	1.2514e-014	4.6303e-010
Y-91	1.0400e-011	3.8480e-001	1.5330e-015	5.6719e-011
Y-92				
Y-93				
Zr-95	1.2000e-011	4.4400e-001	1.7688e-015	6.5446e-011
Zr-97				

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.233e+17	0.000e+00	4.744e-19	0.000e+00	4.069e-20

DOS File: PCCR11.MS5
Run Date: September 2, 2005
Run Time: 3:24:02 PM
Duration: 00:00:18

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	4.541e-01	0.000e+00	2.749e-36	0.000e+00	9.522e-38
0.03	9.631e+17	0.000e+00	1.289e-17	0.000e+00	1.278e-19
0.04	1.712e+00	3.806e-177	6.078e-35	1.683e-179	2.688e-37
0.05	1.571e+00	1.264e-117	1.823e-34	3.368e-120	4.856e-37
0.06	1.627e+00	4.327e-91	1.356e-33	8.595e-94	2.693e-36
0.08	7.366e+17	1.854e-51	1.460e-15	2.933e-54	2.310e-18
0.1	1.139e+00	2.193e-60	1.043e-32	3.355e-63	1.596e-35
0.15	1.121e+08	3.097e-43	5.628e-24	5.100e-46	9.267e-27
0.2	1.490e+15	1.278e-31	1.740e-16	2.255e-34	3.070e-19
0.3	1.552e+15	3.405e-26	2.393e-16	6.459e-29	4.540e-19
0.4	1.928e+16	1.414e-21	2.716e-15	2.755e-24	5.292e-18
0.5	3.453e+14	1.007e-20	4.452e-17	1.977e-23	8.740e-20
0.6	1.777e+15	5.592e-18	3.853e-15	1.091e-20	7.520e-18
0.8	4.312e+14	1.537e-15	5.082e-13	2.924e-18	9.666e-16
1.0	9.391e+11	5.732e-16	1.070e-13	1.057e-18	1.973e-16
1.5	9.723e+11	3.015e-12	2.265e-10	5.073e-15	3.811e-13
2.0	1.433e+05	8.281e-17	3.630e-15	1.281e-19	5.613e-18
3.0	1.179e+00	3.153e-19	7.207e-18	4.278e-22	9.778e-21
TOTALS:	1.848e+18	3.017e-12	2.271e-10	5.077e-15	3.823e-13

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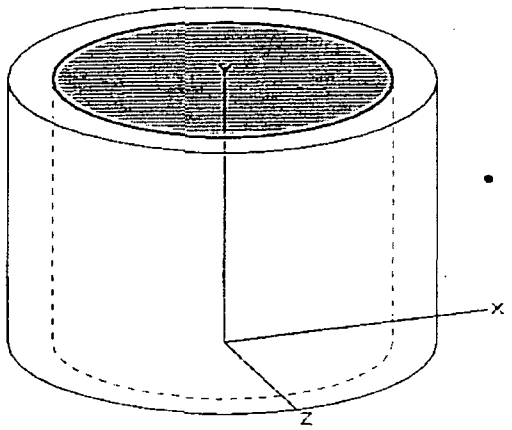
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
DOS File: PCCR12.MS5
Run Date: September 2, 2005
Run Time: 3:24:21 PM
Duration: 00:00:12

EC-RADN-1129
Page 132

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 480 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241				
Ba-137m				
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134				
Cs-136				
Cs-137				
I-131	2.5800e+005	9.5460e+015	3.8029e+001	1.4071e+006
I-132				
I-133	3.4000e-001	1.2580e+010	5.0116e-005	1.8543e+000
I-134				
I-135				
Kr-85	1.3300e+006	4.9210e+016	1.9604e+002	7.2535e+006
Kr-85m				
Kr-87				
Kr-88				
La-140				
La-141				

DOS File: PCCR12.MS5
Run Date: September 2, 2005
Run Time: 3:24:21 PM
Duration: 00:00:12

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99				
Nb-95				
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86				
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Xe-133	1.3800e+007	5.1060e+017	2.0341e+003	7.5262e+007
Xe-135	1.1200e-008	4.1440e+002	1.6509e-012	6.1083e-008
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.141e+16	0.000e+00	1.209e-19	0.000e+00	1.037e-20

DOS File: PCCR12.MS5
Run Date: September 2, 2005
Run Time: 3:24:21 PM
Duration: 00:00:12

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	2.454e+17	0.000e+00	3.285e-18	0.000e+00	3.256e-20
0.08	1.876e+17	4.722e-52	3.719e-16	7.473e-55	5.885e-19
0.15	1.196e+00	3.304e-51	6.003e-32	5.440e-54	9.885e-35
0.2	3.887e+14	3.333e-32	4.538e-17	5.883e-35	8.008e-20
0.3	6.237e+14	1.368e-26	9.617e-17	2.595e-29	1.824e-19
0.4	7.748e+15	5.683e-22	1.091e-15	1.107e-24	2.127e-18
0.5	2.480e+14	7.235e-21	3.198e-17	1.420e-23	6.278e-20
0.6	7.140e+14	2.247e-18	1.548e-15	4.385e-21	3.021e-18
0.8	1.721e+14	6.133e-16	2.028e-13	1.167e-18	3.857e-16
1.0	3.012e+08	1.838e-19	3.433e-17	3.389e-22	6.328e-20
1.5	3.119e+08	9.671e-16	7.266e-14	1.627e-18	1.222e-16
TOTALS:	4.743e+17	1.583e-15	2.787e-13	2.798e-18	5.141e-16

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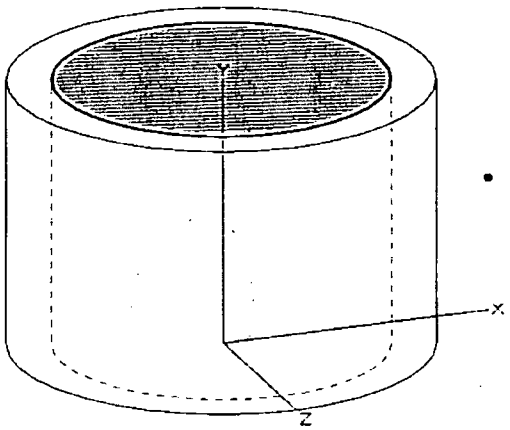
Pennsylvania Power & Light Co.

Page : 1
DOS File: PCCR13.MS5
Run Date: September 2, 2005
Run Time: 3:24:34 PM
Duration: 00:00:11

EC-RADN-1129
Page 135

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

Case Title: PCCR
Description: PRIMARY CONTAINMENT - CR -SOURCE BU - TIME 720 HR
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.8e+3 cm	59 ft 8.0 in
Radius	1.1e+3 cm	35 ft 9.0 in

Dose Points

	X	Y	Z
# 1	1.81e+03 cm	909.3708 cm	0 cm
	59 ft 6.2 in	29 ft 10.0 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.78e+09 cm³	Air	0.00122
Shield 1	285.293 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Standard Indices
Number of Groups : 25
Lower Energy Cutoff : 0
Photons < 0 : Excluded
Library : Grove

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241				
Ba-137m				
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134				
Cs-136				
Cs-137				
I-131	1.0400e+005	3.8480e+015	1.5330e+001	5.6719e+005
I-132				
I-133	1.0900e-004	4.0330e+006	1.6067e-008	5.9446e-004
I-134				
I-135				
Kr-85	1.2600e+006	4.6620e+016	1.8572e+002	6.8718e+006
Kr-85m				
Kr-87				
Kr-88				
La-140				
La-141				

DOS File: PCCR13.MS5
Run Date: September 2, 2005
Run Time: 3:24:34 PM
Duration: 00:00:11

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99				
Nb-95				
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86				
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Xe-133	3.5000e+006	1.2950e+017	5.1590e+002	1.9088e+007
Xe-135				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	7.975e+15	0.000e+00	3.068e-20	0.000e+00	2.632e-21

DOS File: PCCR13.MS5
Run Date: September 2, 2005
Run Time: 3:24:34 PM
Duration: 00:00:11

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	6.230e+16	0.000e+00	8.340e-19	0.000e+00	8.266e-21
0.08	4.763e+16	1.199e-52	9.439e-17	1.897e-55	1.494e-19
0.2	1.024e+14	8.777e-33	1.195e-17	1.549e-35	2.109e-20
0.3	2.514e+14	5.515e-27	3.877e-17	1.046e-29	7.353e-20
0.4	3.123e+15	2.291e-22	4.399e-16	4.463e-25	8.572e-19
0.5	2.162e+14	6.307e-21	2.788e-17	1.238e-23	5.473e-20
0.6	2.878e+14	9.056e-19	6.240e-16	1.768e-21	1.218e-18
0.8	6.936e+13	2.472e-16	8.174e-14	4.702e-19	1.555e-16
1.0	9.657e+04	5.894e-23	1.101e-20	1.086e-25	2.029e-23
1.5	9.998e+04	3.100e-19	2.329e-17	5.216e-22	3.919e-20
TOTALS:	1.220e+17	2.484e-16	8.300e-14	4.725e-19	1.579e-16

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ATTACHMENT 4
MICROSHIELD COMPUTER CODE OUTPUT
REACTOR BUILDING SHINE

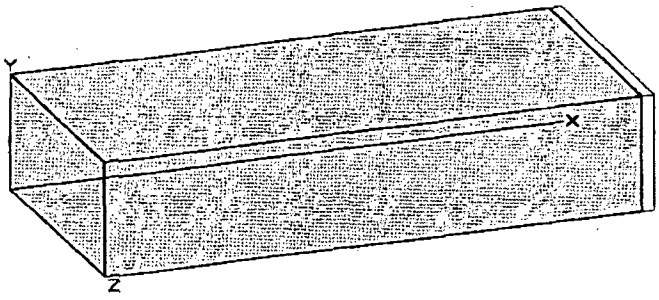
All Attachment 4 pages revised

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

Page : 1
DOS File: S1RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:52:05 AM
Duration: 00:00:18

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

Case Title: Case 1 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF - 0.1667 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Ba-137m	9.7868e-001	3.6211e+010	1.4824e-004	5.4848e+000
Cs-134	1.3745e+000	5.0858e+010	2.0820e-004	7.7034e+000
Cs-136	4.3877e-001	1.6235e+010	6.6460e-005	2.4590e+000
Cs-137	1.0345e+000	3.8278e+010	1.5670e-004	5.7979e+000
I-131	6.5010e+000	2.4054e+011	9.8470e-004	3.6434e+001
I-132	9.1306e+000	3.3783e+011	1.3830e-003	5.1171e+001
I-133	1.3448e+001	4.9759e+011	2.0370e-003	7.5369e+001
I-134	1.3079e+001	4.8391e+011	1.9810e-003	7.3297e+001
I-135	1.2617e+001	4.6681e+011	1.9110e-003	7.0707e+001
Kr-85	9.2297e-002	3.4150e+009	1.3980e-005	5.1726e-001
Kr-85m	1.6300e+000	6.0312e+010	2.4690e-004	9.1353e+000
Kr-87	3.0548e+000	1.1303e+011	4.6270e-004	1.7120e+001
Kr-88	4.4676e+000	1.6530e+011	6.7670e-004	2.5038e+001
Rb-86	1.2973e-002	4.8000e+008	1.9650e-006	7.2705e-002
Xe-133	1.3237e+001	4.8977e+011	2.0050e-003	7.4185e+001
Xe-135	4.5798e+000	1.6945e+011	6.9370e-004	2.5667e+001

Buildup
The material reference is : Source

Integration Parameters
X Direction 20

DOS File: S1RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:52:05 AM
Duration: 00:00:18

Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	2.762e+11	1.303e-106	1.975e-22	1.291e-108	1.957e-24
0.04	1.116e+09	5.641e-55	7.041e-24	2.495e-57	3.114e-26
0.06	2.023e+09	8.253e-27	5.846e-22	1.639e-29	1.161e-24
0.08	1.871e+11	1.221e-17	1.886e-13	1.933e-20	2.985e-16
0.1	3.924e+08	2.289e-17	3.014e-13	3.502e-20	4.611e-16
0.15	7.734e+10	5.698e-12	3.970e-08	9.383e-15	6.537e-11
0.2	2.229e+11	5.846e-10	1.916e-06	1.032e-12	3.382e-09
0.3	6.570e+10	1.334e-08	1.335e-05	2.530e-11	2.531e-08
0.4	3.529e+11	1.243e-06	5.329e-04	2.422e-09	1.038e-06
0.5	6.235e+11	1.821e-05	4.210e-03	3.574e-08	8.263e-06
0.6	7.250e+11	1.114e-04	1.601e-02	2.174e-07	3.124e-05
0.8	1.348e+12	2.540e-03	1.836e-01	4.832e-06	3.492e-04
1.0	5.229e+11	6.231e-03	2.763e-01	1.149e-05	5.093e-04
1.5	4.175e+11	1.092e-01	2.248e+00	1.838e-04	3.781e-03
2.0	2.054e+11	3.678e-01	4.769e+00	5.687e-04	7.375e-03
3.0	1.708e+10	3.078e-01	2.349e+00	4.176e-04	3.187e-03
TOTALS:	5.045e+12	7.937e-01	9.847e+00	1.187e-03	1.524e-02

Results - Dose Point # 2 - (4099.56,430.53,0) cm

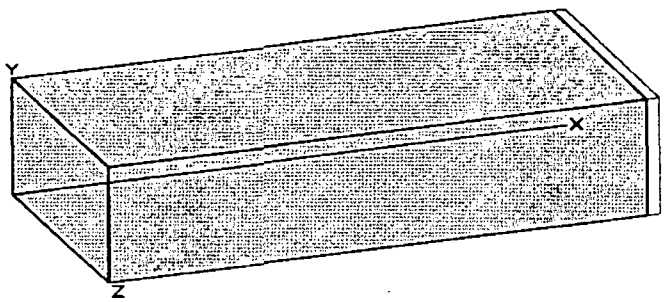
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	2.762e+11	6.475e-107	1.286e-22	6.418e-109	1.275e-24
0.04	1.116e+09	2.801e-55	4.586e-24	1.239e-57	2.028e-26
0.06	2.023e+09	4.140e-27	3.789e-22	8.223e-30	7.526e-25
0.08	1.871e+11	6.178e-18	9.566e-14	9.777e-21	1.514e-16
0.1	3.924e+08	1.164e-17	1.537e-13	1.781e-20	2.352e-16
0.15	7.734e+10	2.920e-12	2.045e-08	4.809e-15	3.368e-11
0.2	2.229e+11	3.011e-10	9.929e-07	5.314e-13	1.752e-09
0.3	6.570e+10	6.923e-09	6.970e-06	1.313e-11	1.322e-08
0.4	3.529e+11	6.493e-07	2.801e-04	1.265e-09	5.457e-07
0.5	6.235e+11	9.560e-06	2.224e-03	1.877e-08	4.366e-06
0.6	7.250e+11	5.876e-05	8.499e-03	1.147e-07	1.659e-05
0.8	1.348e+12	1.350e-03	9.824e-02	2.569e-06	1.869e-04
1.0	5.229e+11	3.335e-03	1.488e-01	6.147e-06	2.744e-04
1.5	4.175e+11	5.922e-02	1.227e+00	9.964e-05	2.064e-03
2.0	2.054e+11	2.013e-01	2.628e+00	3.113e-04	4.064e-03
3.0	1.708e+10	1.706e-01	1.311e+00	2.315e-04	1.779e-03
TOTALS:	5.045e+12	4.359e-01	5.424e+00	6.512e-04	8.389e-03

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

Page : 1
DOS File: S2RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:52:24 AM
Duration: 00:00:18

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

Case Title: Case 2 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF - 0.50 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Ba-137m	8.1379e+000	3.0110e+011	1.2326e-003	4.5608e+001
Cs-134	1.1428e+001	4.2284e+011	1.7310e-003	6.4047e+001
Cs-136	3.6457e+000	1.3489e+011	5.5220e-004	2.0431e+001
Cs-137	8.6025e+000	3.1829e+011	1.3030e-003	4.8211e+001
I-131	5.4295e+001	2.0089e+012	8.2240e-003	3.0429e+002
I-132	7.1434e+001	2.6431e+012	1.0820e-002	4.0034e+002
I-133	1.1124e+002	4.1161e+012	1.6850e-002	6.2345e+002
I-134	8.4044e+001	3.1096e+012	1.2730e-002	4.7101e+002
I-135	1.0187e+002	3.7692e+012	1.5430e-002	5.7091e+002
Kr-85	8.3252e-001	3.0803e+010	1.2610e-004	4.6657e+000
Kr-85m	1.3963e+001	5.1664e+011	2.1150e-003	7.8255e+001
Kr-87	2.2969e+001	8.4984e+011	3.4790e-003	1.2872e+002
Kr-88	3.7143e+001	1.3743e+012	5.6260e-003	2.0816e+002
Rb-86	1.0781e-001	3.9890e+009	1.6330e-005	6.0421e-001
Xe-133	1.1963e+002	4.4263e+012	1.8120e-002	6.7044e+002
Xe-135	4.5059e+001	1.6672e+012	6.8250e-003	2.5253e+002

Buildup
The material reference is : Source

Integration Parameters
X Direction 20

DOS File: S2RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:52:24 AM
Duration: 00:00:18

Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	2.465e+12	1.163e-105	1.762e-21	1.152e-107	1.746e-23
0.04	9.273e+09	4.689e-54	5.853e-23	2.074e-56	2.589e-25
0.06	1.681e+10	6.857e-26	4.858e-21	1.362e-28	9.649e-24
0.08	1.685e+12	1.101e-16	1.699e-12	1.742e-19	2.689e-15
0.1	3.262e+09	1.903e-16	2.505e-12	2.911e-19	3.833e-15
0.15	6.109e+11	4.501e-11	3.136e-07	7.411e-14	5.164e-10
0.2	2.056e+12	5.393e-09	1.768e-05	9.519e-12	3.121e-08
0.3	5.348e+11	1.086e-07	1.086e-04	2.059e-10	2.060e-07
0.4	2.773e+12	9.770e-06	4.187e-03	1.904e-08	8.159e-06
0.5	4.997e+12	1.459e-04	3.374e-02	2.864e-07	6.622e-05
0.6	5.512e+12	8.469e-04	1.217e-01	1.653e-06	2.376e-04
0.8	9.425e+12	1.776e-02	1.284e+00	3.378e-05	2.441e-03
1.0	3.898e+12	4.645e-02	2.060e+00	8.562e-05	3.797e-03
1.5	3.258e+12	8.524e-01	1.754e+01	1.434e-03	2.951e-02
2.0	1.614e+12	2.890e+00	3.747e+01	4.468e-03	5.794e-02
3.0	1.294e+11	2.333e+00	1.780e+01	3.165e-03	2.415e-02
TOTALS:	3.899e+13	6.140e+00	7.632e+01	9.189e-03	1.182e-01

Results - Dose Point # 2 - (4099.56,430.53,0) cm

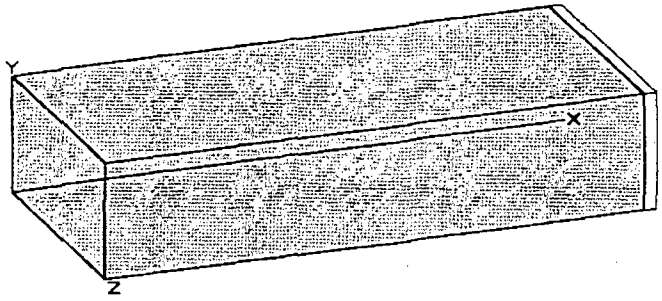
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	2.465e+12	5.778e-106	1.148e-21	5.726e-108	1.137e-23
0.04	9.273e+09	2.328e-54	3.812e-23	1.030e-56	1.686e-25
0.06	1.681e+10	3.440e-26	3.148e-21	6.832e-29	6.253e-24
0.08	1.685e+12	5.567e-17	8.619e-13	8.809e-20	1.364e-15
0.1	3.262e+09	9.676e-17	1.278e-12	1.480e-19	1.955e-15
0.15	6.109e+11	2.307e-11	1.616e-07	3.798e-14	2.660e-10
0.2	2.056e+12	2.778e-09	9.161e-06	4.903e-12	1.617e-08
0.3	5.348e+11	5.635e-08	5.673e-05	1.069e-10	1.076e-07
0.4	2.773e+12	5.103e-06	2.201e-03	9.942e-09	4.288e-06
0.5	4.997e+12	7.661e-05	1.783e-02	1.504e-07	3.499e-05
0.6	5.512e+12	4.467e-04	6.462e-02	8.720e-07	1.261e-04
0.8	9.425e+12	9.442e-03	6.869e-01	1.796e-05	1.306e-03
1.0	3.898e+12	2.486e-02	1.110e+00	4.582e-05	2.045e-03
1.5	3.258e+12	4.621e-01	9.573e+00	7.775e-04	1.611e-02
2.0	1.614e+12	1.581e+00	2.065e+01	2.445e-03	3.193e-02
3.0	1.294e+11	1.293e+00	9.936e+00	1.754e-03	1.348e-02
TOTALS:	3.899e+13	3.371e+00	4.204e+01	5.042e-03	6.503e-02

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

Page : 1
DOS File: S3RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:52:42 AM
Duration: 00:00:22

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

Case Title: Case 3 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF- 1.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	1.7733e-005	6.5613e+005	2.6860e-009	9.9382e-005
Ba-137m	3.2745e+001	1.2116e+012	4.9599e-003	1.8352e+002
Ba-139	8.2394e+000	3.0486e+011	1.2480e-003	4.6176e+001
Ba-140	1.3646e+001	5.0492e+011	2.0670e-003	7.6479e+001
Ce-141	3.1366e-001	1.1606e+010	4.7510e-005	1.7579e+000
Ce-143	2.8521e-001	1.0553e+010	4.3200e-005	1.5984e+000
Ce-144	2.6375e-001	9.7588e+009	3.9950e-005	1.4781e+000
Cm-242	4.6426e-003	1.7177e+008	7.0320e-007	2.6018e-002
Cm-244	2.7214e-004	1.0069e+007	4.1220e-008	1.5251e-003
Co-58	5.1687e-003	1.9124e+008	7.8290e-007	2.8967e-002
Co-60	2.7821e-003	1.0294e+008	4.2140e-007	1.5592e-002
Cs-134	4.5997e+001	1.7019e+012	6.9670e-003	2.5778e+002
Cs-136	1.4657e+001	5.4229e+011	2.2200e-003	8.2140e+001
Cs-137	3.4615e+001	1.2807e+012	5.2430e-003	1.9399e+002
I-131	2.3807e+002	8.8086e+012	3.6060e-002	1.3342e+003
I-132	2.9274e+002	1.0831e+013	4.4340e-002	1.6406e+003
I-133	4.8043e+002	1.7776e+013	7.2770e-002	2.6925e+003
I-134	2.4857e+002	9.1970e+012	3.7650e-002	1.3930e+003
I-135	4.2451e+002	1.5707e+013	6.4300e-002	2.3791e+003
Kr-85	7.7310e+000	2.8605e+011	1.1710e-003	4.3327e+001
Kr-85m	1.2003e+002	4.4409e+012	1.8180e-002	6.7266e+002

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87	1.6248e+002	6.0116e+012	2.4610e-002	9.1057e+002
Kr-88	3.0541e+002	1.1300e+013	4.6260e-002	1.7116e+003
La-140	2.3285e-001	8.6156e+009	3.5270e-005	1.3050e+000
La-141	1.0405e-001	3.8498e+009	1.5760e-005	5.8312e-001
La-142	7.7508e-002	2.8678e+009	1.1740e-005	4.3438e-001
Mo-99	1.7436e+000	6.4513e+010	2.6410e-004	9.7717e+000
Nb-95	1.3396e-001	4.9564e+009	2.0290e-005	7.5073e-001
Nd-147	5.0519e-002	1.8692e+009	7.6520e-006	2.8312e-001
Np-239	3.6556e+000	1.3526e+011	5.5370e-004	2.0487e+001
Pr-143	1.1243e-001	4.1600e+009	1.7030e-005	6.3011e-001
Pr-144	2.5998e-001	9.6193e+009	3.9379e-005	1.4570e+000
Pu-238	7.9489e-004	2.9411e+007	1.2040e-007	4.4548e-003
Pu-239	8.4440e-005	3.1243e+006	1.2790e-008	4.7323e-004
Pu-240	1.3580e-004	5.0248e+006	2.0570e-008	7.6109e-004
Pu-241	3.3486e-002	1.2390e+009	5.0720e-006	1.8766e-001
Rb-86	4.3349e-001	1.6039e+010	6.5660e-005	2.4294e+000
Rh-103m	1.4967e+000	5.5378e+010	2.2670e-004	8.3880e+000
Rh-105	9.6720e-001	3.5786e+010	1.4650e-004	5.4205e+000
Rh-106	5.9795e-001	2.2124e+010	9.0570e-005	3.3511e+000
Ru-103	1.5006e+000	5.5524e+010	2.2730e-004	8.4101e+000
Ru-105	8.8798e-001	3.2855e+010	1.3450e-004	4.9765e+000
Ru-106	5.9795e-001	2.2124e+010	9.0570e-005	3.3511e+000
Sb-127	1.6267e+000	6.0190e+010	2.4640e-004	9.1168e+000
Sb-129	5.1595e+000	1.9090e+011	7.8150e-004	2.8915e+001
Sr-89	7.1698e+000	2.6528e+011	1.0860e-003	4.0182e+001
Sr-90	9.1438e-001	3.3832e+010	1.3850e-004	5.1245e+000
Sr-91	8.5034e+000	3.1463e+011	1.2880e-003	4.7656e+001
Sr-92	7.5197e+000	2.7823e+011	1.1390e-003	4.2143e+001
Tc-99m	1.5607e+000	5.7747e+010	2.3640e-004	8.7468e+000
Te-127	1.6248e+000	6.0116e+010	2.4610e-004	9.1057e+000
Te-127m	2.7715e-001	1.0255e+010	4.1980e-005	1.5533e+000
Te-129	5.4863e+000	2.0299e+011	8.3100e-004	3.0747e+001
Te-129m	1.1606e+000	4.2944e+010	1.7580e-004	6.5046e+000
Te-131m	3.6641e+000	1.3557e+011	5.5500e-004	2.0535e+001
Te-132	2.6639e+001	9.8565e+011	4.0350e-003	1.4930e+002
Xe-133	1.1098e+003	4.1063e+013	1.6810e-001	6.2197e+003
Xe-135	4.1982e+002	1.5534e+013	6.3590e-002	2.3528e+003
Y-90	1.3164e-002	4.8709e+008	1.9940e-006	7.3778e-002
Y-91	9.4079e-002	3.4809e+009	1.4250e-005	5.2725e-001
Y-92	6.5598e-001	2.4271e+010	9.9360e-005	3.6763e+000
Y-93	6.9652e-002	2.5771e+009	1.0550e-005	3.9035e-001
Zr-95	1.3389e-001	4.9539e+009	2.0280e-005	7.5036e-001
Zr-97	1.2722e-001	4.7072e+009	1.9270e-005	7.1299e-001

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.448e+06	0.000e+00	8.569e-29	0.000e+00	7.350e-30
0.02	1.132e+10	0.000e+00	4.270e-25	0.000e+00	1.479e-26
0.03	2.244e+13	1.058e-104	1.604e-20	1.049e-106	1.590e-22
0.04	5.197e+10	2.628e-53	3.280e-22	1.162e-55	1.451e-24
0.05	1.296e+11	1.250e-33	7.425e-21	3.330e-36	1.978e-23
0.06	7.124e+10	2.906e-25	2.058e-20	5.771e-28	4.088e-23
0.08	1.534e+13	1.002e-15	1.547e-11	1.585e-18	2.448e-14
0.1	1.721e+11	1.004e-14	1.322e-10	1.536e-17	2.023e-13
0.15	4.447e+12	3.276e-10	2.283e-06	5.395e-13	3.759e-09
0.2	1.858e+13	4.875e-08	1.598e-04	8.603e-11	2.820e-07
0.3	2.662e+12	5.403e-07	5.406e-04	1.025e-09	1.026e-06
0.4	1.294e+13	4.557e-05	1.953e-02	8.880e-08	3.806e-05
0.5	2.116e+13	6.177e-04	1.428e-01	1.213e-06	2.804e-04
0.6	2.185e+13	3.357e-03	4.824e-01	6.552e-06	9.415e-04
0.8	3.384e+13	6.377e-02	4.609e+00	1.213e-04	8.766e-03
1.0	1.548e+13	1.845e-01	8.179e+00	3.400e-04	1.508e-02
1.5	1.444e+13	3.778e+00	7.773e+01	6.356e-03	1.308e-01
2.0	9.897e+12	1.772e+01	2.298e+02	2.740e-02	3.553e-01
3.0	9.289e+11	1.674e+01	1.278e+02	2.271e-02	1.733e-01
4.0	7.528e+07	5.317e-03	2.961e-02	6.577e-06	3.663e-05
TOTALS:	1.944e+14	3.850e+01	4.487e+02	5.695e-02	6.846e-01

Results - Dose Point # 2 - (4099.56,430.53,0) cm

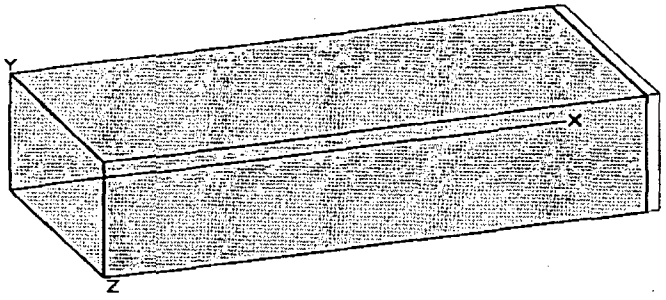
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.448e+06	0.000e+00	5.581e-29	0.000e+00	4.787e-30
0.02	1.132e+10	0.000e+00	2.781e-25	0.000e+00	9.633e-27
0.03	2.244e+13	5.259e-105	1.045e-20	5.212e-107	1.035e-22
0.04	5.197e+10	1.304e-53	2.136e-22	5.769e-56	9.448e-25
0.05	1.296e+11	6.236e-34	4.836e-21	1.661e-36	1.288e-23
0.06	7.124e+10	1.458e-25	1.334e-20	2.895e-28	2.650e-23
0.08	1.534e+13	5.067e-16	7.845e-12	8.018e-19	1.241e-14
0.1	1.721e+11	5.106e-15	6.744e-11	7.812e-18	1.032e-13
0.15	4.447e+12	1.679e-10	1.176e-06	2.765e-13	1.937e-09
0.2	1.858e+13	2.511e-08	8.280e-05	4.432e-11	1.461e-07
0.3	2.662e+12	2.804e-07	2.824e-04	5.320e-10	5.356e-07
0.4	1.294e+13	2.380e-05	1.027e-02	4.638e-08	2.000e-05
0.5	2.116e+13	3.243e-04	7.547e-02	6.367e-07	1.481e-04
0.6	2.185e+13	1.771e-03	2.561e-01	3.456e-06	4.999e-04
0.8	3.384e+13	3.390e-02	2.466e+00	6.449e-05	4.691e-03
1.0	1.548e+13	9.872e-02	4.406e+00	1.820e-04	8.122e-03
1.5	1.444e+13	2.048e+00	4.243e+01	3.446e-03	7.138e-02
2.0	9.897e+12	9.698e+00	1.266e+02	1.500e-02	1.958e-01
3.0	9.289e+11	9.280e+00	7.131e+01	1.259e-02	9.674e-02
4.0	7.528e+07	2.972e-03	1.666e-02	3.676e-06	2.061e-05
TOTALS:	1.944e+14	2.116e+01	2.476e+02	3.129e-02	3.774e-01

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

Page : 1
DOS File: S4RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:53:05 AM
Duration: 00:00:22

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

Case Title: Case 4 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF- 2.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	1.3963e-004	5.1664e+006	2.1150e-008	7.8255e-004
Ba-137m	1.2947e+002	4.7904e+012	1.9611e-002	7.2559e+002
Ba-139	3.9223e+001	1.4512e+012	5.9410e-003	2.1982e+002
Ba-140	1.0722e+002	3.9670e+012	1.6240e-002	6.0088e+002
Ce-141	2.4685e+000	9.1335e+010	3.7390e-004	1.3834e+001
Ce-143	2.1991e+000	8.1368e+010	3.3310e-004	1.2325e+001
Ce-144	2.0770e+000	7.6849e+010	3.1460e-004	1.1640e+001
Cm-242	3.6549e-002	1.3523e+009	5.5360e-006	2.0483e-001
Cm-244	2.1424e-003	7.9268e+007	3.2450e-007	1.2006e-002
Co-58	4.0682e-002	1.5052e+009	6.1620e-006	2.2799e-001
Co-60	2.1906e-002	8.1051e+008	3.3180e-006	1.2277e-001
Cs-134	1.8182e+002	6.7274e+012	2.7540e-002	1.0190e+003
Cs-136	5.7814e+001	2.1391e+012	8.7570e-003	3.2401e+002
Cs-137	1.3686e+002	5.0638e+012	2.0730e-002	7.6701e+002
I-131	1.0187e+003	3.7692e+013	1.5430e-001	5.7091e+003
I-132	1.1045e+003	4.0867e+013	1.6730e-001	6.1901e+003
I-133	1.9945e+003	7.3796e+013	3.0210e-001	1.1178e+004
I-134	4.8400e+002	1.7908e+013	7.3310e-002	2.7125e+003
I-135	1.6413e+003	6.0727e+013	2.4860e-001	9.1982e+003
Kr-85	5.1727e+001	1.9139e+012	7.8350e-003	2.8990e+002
Kr-85m	6.8793e+002	2.5454e+013	1.0420e-001	3.8554e+003

DOS File: S4RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:53:05 AM
Duration: 00:00:22

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87	6.3017e+002	2.3316e+013	9.5450e-002	3.5316e+003
Kr-88	1.6003e+003	5.9213e+013	2.4240e-001	8.9688e+003
La-140	2.9901e+000	1.1063e+011	4.5290e-004	1.6757e+001
La-141	6.8661e-001	2.5405e+010	1.0400e-004	3.8480e+000
La-142	3.8946e-001	1.4410e+010	5.8990e-005	2.1826e+000
Mo-99	1.3587e+001	5.0272e+011	2.0580e-003	7.6146e+001
Nb-95	1.0550e+000	3.9035e+010	1.5980e-004	5.9126e+000
Nd-147	3.9672e-001	1.4679e+010	6.0090e-005	2.2233e+000
Np-239	2.8428e+001	1.0519e+012	4.3060e-003	1.5932e+002
Pr-143	8.8732e-001	3.2831e+010	1.3440e-004	4.9728e+000
Pr-144	2.0473e+000	7.5750e+010	3.1010e-004	1.1474e+001
Pu-238	6.2594e-003	2.3160e+008	9.4810e-007	3.5080e-002
Pu-239	6.6483e-004	2.4599e+007	1.0070e-007	3.7259e-003
Pu-240	1.0689e-003	3.9548e+007	1.6190e-007	5.9903e-003
Pu-241	2.6369e-001	9.7564e+009	3.9940e-005	1.4778e+000
Rb-86	1.7113e+000	6.3316e+010	2.5920e-004	9.5904e+000
Rh-103m	1.1780e+001	4.3586e+011	1.7843e-003	6.6019e+001
Rh-105	7.5924e+000	2.8092e+011	1.1500e-003	4.2550e+001
Rh-106	4.7079e+000	1.7419e+011	7.1310e-004	2.6385e+001
Ru-103	1.1811e+001	4.3701e+011	1.7890e-003	6.6193e+001
Ru-105	5.9795e+000	2.2124e+011	9.0570e-004	3.3511e+001
Ru-106	4.7079e+000	1.7419e+011	7.1310e-004	2.6385e+001
Sb-127	1.2716e+001	4.7048e+011	1.9260e-003	7.1262e+001
Sb-129	3.4601e+001	1.2803e+012	5.2410e-003	1.9392e+002
Sr-89	5.6441e+001	2.0883e+012	8.5490e-003	3.1631e+002
Sr-90	7.2028e+000	2.6651e+011	1.0910e-003	4.0367e+001
Sr-91	6.2238e+001	2.3028e+012	9.4270e-003	3.4880e+002
Sr-92	4.5831e+001	1.6958e+012	6.9420e-003	2.5685e+002
Tc-99m	1.2267e+001	4.5386e+011	1.8580e-003	6.8746e+001
Te-127	1.2782e+001	4.7292e+011	1.9360e-003	7.1632e+001
Te-127m	2.1826e+000	8.0758e+010	3.3060e-004	1.2232e+001
Te-129	3.9810e+001	1.4730e+012	6.0300e-003	2.2311e+002
Te-129m	9.1372e+000	3.3808e+011	1.3840e-003	5.1208e+001
Te-131m	2.8191e+001	1.0431e+012	4.2700e-003	1.5799e+002
Te-132	2.0790e+002	7.6923e+012	3.1490e-002	1.1651e+003
Xe-133	7.4075e+003	2.7408e+014	1.1220e+000	4.1514e+004
Xe-135	2.8587e+003	1.0577e+014	4.3300e-001	1.6021e+004
Y-90	1.5277e-001	5.6525e+009	2.3140e-005	8.5618e-001
Y-91	7.4867e-001	2.7701e+010	1.1340e-004	4.1958e+000
Y-92	1.0167e+001	3.7619e+011	1.5400e-003	5.6980e+001
Y-93	5.1186e-001	1.8939e+010	7.7530e-005	2.8686e+000
Zr-95	1.0537e+000	3.8986e+010	1.5960e-004	5.9052e+000
Zr-97	9.6126e-001	3.5567e+010	1.4560e-004	5.3872e+000

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

DOS File: S4RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:53:05 AM
Duration: 00:00:22

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.952e+07	0.000e+00	6.581e-28	0.000e+00	5.645e-29
0.02	8.869e+10	0.000e+00	3.345e-24	0.000e+00	1.159e-25
0.03	1.478e+14	6.970e-104	1.056e-19	6.908e-106	1.047e-21
0.04	2.558e+11	1.293e-52	1.614e-21	5.720e-55	7.139e-24
0.05	1.011e+12	9.755e-33	5.795e-20	2.599e-35	1.544e-22
0.06	2.949e+11	1.203e-24	8.522e-20	2.389e-27	1.693e-22
0.08	1.018e+14	6.644e-15	1.026e-10	1.051e-17	1.623e-13
0.1	1.273e+12	7.426e-14	9.778e-10	1.136e-16	1.496e-12
0.15	2.369e+13	1.745e-09	1.216e-05	2.874e-12	2.002e-08
0.2	1.202e+14	3.154e-07	1.034e-03	5.567e-10	1.825e-06
0.3	1.206e+13	2.448e-06	2.449e-03	4.643e-09	4.646e-06
0.4	5.172e+13	1.822e-04	7.810e-02	3.550e-07	1.522e-04
0.5	8.491e+13	2.479e-03	5.733e-01	4.867e-06	1.125e-03
0.6	7.971e+13	1.225e-02	1.760e+00	2.390e-05	3.435e-03
0.8	1.030e+14	1.941e-01	1.403e+01	3.692e-04	2.668e-02
1.0	5.506e+13	6.561e-01	2.909e+01	1.209e-03	5.363e-02
1.5	5.691e+13	1.489e+01	3.064e+02	2.505e-02	5.155e-01
2.0	4.629e+13	8.288e+01	1.075e+03	1.282e-01	1.662e+00
3.0	3.725e+12	6.713e+01	5.124e+02	9.108e-02	6.951e-01
4.0	3.783e+08	2.671e-02	1.488e-01	3.305e-05	1.841e-04
TOTALS:	8.898e+14	1.658e+02	1.939e+03	2.459e-01	2.958e+00

Results - Dose Point # 2 - (4099.56,430.53,0) cm

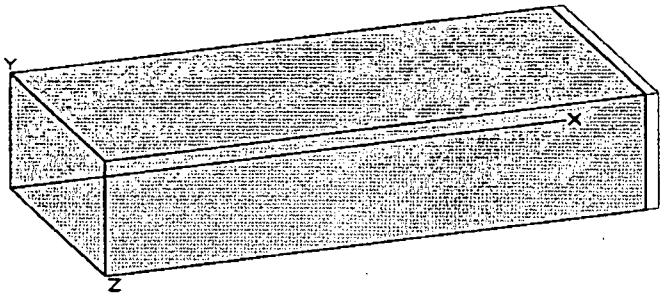
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.952e+07	0.000e+00	4.286e-28	0.000e+00	3.677e-29
0.02	8.869e+10	0.000e+00	2.178e-24	0.000e+00	7.546e-26
0.03	1.478e+14	3.464e-104	6.880e-20	3.433e-106	6.818e-22
0.04	2.558e+11	6.420e-53	1.051e-21	2.839e-55	4.650e-24
0.05	1.011e+12	4.867e-33	3.774e-20	1.297e-35	1.005e-22
0.06	2.949e+11	6.035e-25	5.523e-20	1.199e-27	1.097e-22
0.08	1.018e+14	3.361e-15	5.203e-11	5.318e-18	8.234e-14
0.1	1.273e+12	3.776e-14	4.988e-10	5.778e-17	7.631e-13
0.15	2.369e+13	8.944e-10	6.265e-06	1.473e-12	1.032e-08
0.2	1.202e+14	1.625e-07	5.357e-04	2.867e-10	9.455e-07
0.3	1.206e+13	1.271e-06	1.279e-03	2.410e-09	2.427e-06
0.4	5.172e+13	9.517e-05	4.105e-02	1.854e-07	7.998e-05
0.5	8.491e+13	1.302e-03	3.029e-01	2.555e-06	5.946e-04
0.6	7.971e+13	6.460e-03	9.344e-01	1.261e-05	1.824e-03
0.8	1.030e+14	1.032e-01	7.507e+00	1.963e-04	1.428e-02
1.0	5.506e+13	3.511e-01	1.567e+01	6.472e-04	2.889e-02
1.5	5.691e+13	8.073e+00	1.672e+02	1.358e-02	2.814e-01
2.0	4.629e+13	4.536e+01	5.922e+02	7.014e-02	9.158e-01
3.0	3.725e+12	3.721e+01	2.860e+02	5.049e-02	3.880e-01
4.0	3.783e+08	1.493e-02	8.373e-02	1.847e-05	1.036e-04
TOTALS:	8.898e+14	9.112e+01	1.070e+03	1.351e-01	1.631e+00

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

Page : 1
DOS File: S5RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:53:28 AM
Duration: 00:00:22

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

Case Title: Case 5 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF- 4.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	2.5187e-004	9.3191e+006	3.8150e-008	1.4115e-003
Ba-137m	2.0848e+002	7.7136e+012	3.1577e-002	1.1684e+003
Ba-139	2.5860e+001	9.5683e+011	3.9170e-003	1.4493e+002
Ba-140	1.9232e+002	7.1158e+012	2.9130e-002	1.0778e+003
Ce-141	4.4445e+000	1.6445e+011	6.7320e-004	2.4908e+001
Ce-143	3.8008e+000	1.4063e+011	5.7570e-004	2.1301e+001
Ce-144	3.7427e+000	1.3848e+011	5.6690e-004	2.0975e+001
Cm-242	6.5849e-002	2.4364e+009	9.9740e-006	3.6904e-001
Cm-244	3.8622e-003	1.4290e+008	5.8500e-007	2.1645e-002
Co-58	7.3283e-002	2.7115e+009	1.1100e-005	4.1070e-001
Co-60	3.9487e-002	1.4610e+009	5.9810e-006	2.2130e-001
Cs-134	2.9280e+002	1.0834e+013	4.4350e-002	1.6410e+003
Cs-136	9.2693e+001	3.4296e+012	1.4040e-002	5.1948e+002
Cs-137	2.2038e+002	8.1539e+012	3.3380e-002	1.2351e+003
I-131	1.7654e+003	6.5319e+013	2.6740e-001	9.8938e+003
I-132	1.2887e+003	4.7683e+013	1.9520e-001	7.2224e+003
I-133	3.2568e+003	1.2050e+014	4.9330e-001	1.8252e+004
I-134	1.7377e+002	6.4293e+012	2.6320e-002	9.7384e+002
I-135	2.3219e+003	8.5912e+013	3.5170e-001	1.3013e+004
Kr-85	1.6829e+002	6.2266e+012	2.5490e-002	9.4313e+002
Kr-85m	1.6419e+003	6.0751e+013	2.4870e-001	9.2019e+003

For Information Only
DOS File: S5RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:53:28 AM
Duration: 00:00:22

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87	6.8925e+002	2.5502e+013	1.0440e-001	3.8628e+003
Kr-88	3.1954e+003	1.1823e+014	4.8400e-001	1.7908e+004
La-140	1.1257e+001	4.1649e+011	1.7050e-003	6.3085e+001
La-141	8.7015e-001	3.2196e+010	1.3180e-004	4.8766e+000
La-142	2.8567e-001	1.0570e+010	4.3270e-005	1.6010e+000
Mo-99	2.3985e+001	8.8745e+011	3.6330e-003	1.3442e+002
Nb-95	1.9007e+000	7.0327e+010	2.8790e-004	1.0652e+001
Nd-147	7.1104e-001	2.6309e+010	1.0770e-004	3.9849e+000
Np-239	5.0004e+001	1.8501e+012	7.5740e-003	2.8024e+002
Pr-143	1.6076e+000	5.9481e+010	2.4350e-004	9.0095e+000
Pr-144	3.6892e+000	1.3650e+011	5.5879e-004	2.0675e+001
Pu-238	1.1283e-002	4.1747e+008	1.7090e-006	6.3233e-002
Pu-239	1.1989e-003	4.4361e+007	1.8160e-007	6.7192e-003
Pu-240	1.9271e-003	7.1304e+007	2.9190e-007	1.0800e-002
Pu-241	4.7528e-001	1.7585e+010	7.1990e-005	2.6636e+000
Rb-86	2.7471e+000	1.0164e+011	4.1610e-004	1.5396e+001
Rh-103m	2.1196e+001	7.8426e+011	3.2105e-003	1.1879e+002
Rh-105	1.3514e+001	5.0003e+011	2.0470e-003	7.5739e+001
Rh-106	8.4836e+000	3.1389e+011	1.2850e-003	4.7545e+001
Ru-103	2.1252e+001	7.8632e+011	3.2190e-003	1.1910e+002
Ru-105	7.8895e+000	2.9191e+011	1.1950e-003	4.4215e+001
Ru-106	8.4836e+000	3.1389e+011	1.2850e-003	4.7545e+001
Sb-127	2.2579e+001	8.3542e+011	3.4200e-003	1.2654e+002
Sb-129	4.5250e+001	1.6743e+012	6.8540e-003	2.5360e+002
Sr-89	1.0161e+002	3.7594e+012	1.5390e-002	5.6943e+002
Sr-90	1.2980e+001	4.8025e+011	1.9660e-003	7.2742e+001
Sr-91	9.6918e+001	3.5860e+012	1.4680e-002	5.4316e+002
Sr-92	4.9535e+001	1.8328e+012	7.5030e-003	2.7761e+002
Tc-99m	2.1972e+001	8.1295e+011	3.3280e-003	1.2314e+002
Te-127	2.2975e+001	8.5008e+011	3.4800e-003	1.2876e+002
Te-127m	3.9342e+000	1.4556e+011	5.9590e-004	2.2048e+001
Te-129	5.8006e+001	2.1462e+012	8.7860e-003	3.2508e+002
Te-129m	1.6466e+001	6.0922e+011	2.4940e-003	9.2278e+001
Te-131m	4.8519e+001	1.7952e+012	7.3490e-003	2.7191e+002
Te-132	3.6813e+002	1.3621e+013	5.5760e-002	2.0631e+003
Xe-133	2.3992e+004	8.8770e+014	3.6340e+000	1.3446e+005
Xe-135	9.3221e+003	3.4492e+014	1.4120e+000	5.2244e+004
Y-90	5.2717e-001	1.9505e+010	7.9850e-005	2.9545e+000
Y-91	1.3878e+000	5.1347e+010	2.1020e-004	7.7774e+000
Y-92	3.1452e+001	1.1637e+012	4.7640e-003	1.7627e+002
Y-93	8.0413e-001	2.9753e+010	1.2180e-004	4.5066e+000
Zr-95	1.8974e+000	7.0205e+010	2.8740e-004	1.0634e+001
Zr-97	1.5964e+000	5.9066e+010	2.4180e-004	8.9466e+000

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

DOS File: S5RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:53:28 AM
Duration: 00:00:22

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	8.516e+07	0.000e+00	1.132e-27	0.000e+00	9.708e-29
0.02	1.581e+11	0.000e+00	5.964e-24	0.000e+00	2.066e-25
0.03	4.620e+14	2.179e-103	3.303e-19	2.160e-105	3.273e-21
0.04	4.182e+11	2.115e-52	2.640e-21	9.353e-55	1.168e-23
0.05	1.791e+12	1.727e-32	1.026e-19	4.601e-35	2.734e-22
0.06	4.771e+11	1.946e-24	1.379e-19	3.865e-27	2.738e-22
0.08	3.278e+14	2.140e-14	3.305e-10	3.387e-17	5.230e-13
0.1	2.264e+12	1.321e-13	1.739e-09	2.021e-16	2.661e-12
0.15	5.308e+13	3.911e-09	2.725e-05	6.440e-12	4.487e-08
0.2	3.571e+14	9.366e-07	3.071e-03	1.653e-09	5.419e-06
0.3	2.165e+13	4.394e-06	4.397e-03	8.335e-09	8.341e-06
0.4	7.894e+13	2.781e-04	1.192e-01	5.419e-07	2.323e-04
0.5	1.305e+14	3.812e-03	8.813e-01	7.482e-06	1.730e-03
0.6	1.031e+14	1.584e-02	2.277e+00	3.092e-05	4.444e-03
0.8	1.108e+14	2.088e-01	1.509e+01	3.972e-04	2.870e-02
1.0	7.133e+13	8.499e-01	3.769e+01	1.567e-03	6.947e-02
1.5	8.231e+13	2.153e+01	4.431e+02	3.623e-02	7.455e-01
2.0	8.436e+13	1.510e+02	1.959e+03	2.336e-01	3.029e+00
3.0	4.496e+12	8.103e+01	6.184e+02	1.099e-01	8.390e-01
4.0	2.775e+08	1.960e-02	1.091e-01	2.424e-05	1.350e-04
TOTALS:	1.893e+15	2.547e+02	3.076e+03	3.818e-01	4.718e+00

Results - Dose Point # 2 - (4099.56,430.53,0) cm

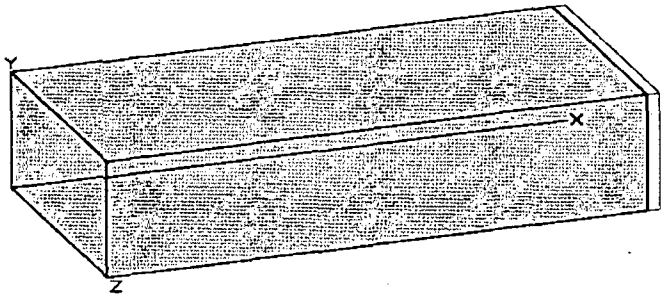
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	8.516e+07	0.000e+00	7.372e-28	0.000e+00	6.323e-29
0.02	1.581e+11	0.000e+00	3.884e-24	0.000e+00	1.345e-25
0.03	4.620e+14	1.083e-103	2.151e-19	1.073e-105	2.132e-21
0.04	4.182e+11	1.050e-52	1.719e-21	4.643e-55	7.604e-24
0.05	1.791e+12	8.618e-33	6.683e-20	2.296e-35	1.780e-22
0.06	4.771e+11	9.762e-25	8.935e-20	1.939e-27	1.775e-22
0.08	3.278e+14	1.083e-14	1.676e-10	1.713e-17	2.653e-13
0.1	2.264e+12	6.717e-14	8.872e-10	1.028e-16	1.357e-12
0.15	5.308e+13	2.004e-09	1.404e-05	3.300e-12	2.312e-08
0.2	3.571e+14	4.825e-07	1.591e-03	8.515e-10	2.808e-06
0.3	2.165e+13	2.281e-06	2.297e-03	4.327e-09	4.356e-06
0.4	7.894e+13	1.453e-04	6.265e-02	2.830e-07	1.221e-04
0.5	1.305e+14	2.001e-03	4.657e-01	3.928e-06	9.141e-04
0.6	1.031e+14	8.357e-03	1.209e+00	1.631e-05	2.359e-03
0.8	1.108e+14	1.110e-01	8.076e+00	2.112e-04	1.536e-02
1.0	7.133e+13	4.549e-01	2.030e+01	8.385e-04	3.743e-02
1.5	8.231e+13	1.167e+01	2.418e+02	1.964e-02	4.069e-01
2.0	8.436e+13	8.266e+01	1.079e+03	1.278e-01	1.669e+00
3.0	4.496e+12	4.492e+01	3.451e+02	6.094e-02	4.682e-01
4.0	2.775e+08	1.095e-02	6.141e-02	1.355e-05	7.598e-05
TOTALS:	1.893e+15	1.398e+02	1.696e+03	2.095e-01	2.600e+00

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

Page : 1
DOS File: S6RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:53:51 AM
Duration: 00:00:22

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

Case Title: Case 6 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF- 8.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	1.9885e-004	7.3576e+006	3.0120e-008	1.1144e-003
Ba-137m	1.6276e+002	6.0221e+012	2.4653e-002	9.1215e+002
Ba-139	2.7266e+000	1.0089e+011	4.1300e-004	1.5281e+001
Ba-140	1.5026e+002	5.5597e+012	2.2760e-002	8.4212e+002
Ce-141	3.4925e+000	1.2922e+011	5.2900e-004	1.9573e+001
Ce-143	2.7544e+000	1.0191e+011	4.1720e-004	1.5436e+001
Ce-144	2.9491e+000	1.0912e+011	4.4670e-004	1.6528e+001
Cm-242	5.1872e-002	1.9193e+009	7.8570e-006	2.9071e-001
Cm-244	3.0442e-003	1.1264e+008	4.6110e-007	1.7061e-002
Co-58	5.7656e-002	2.1333e+009	8.7330e-006	3.2312e-001
Co-60	3.1122e-002	1.1515e+009	4.7140e-006	1.7442e-001
Cs-134	2.2856e+002	8.4568e+012	3.4620e-002	1.2809e+003
Cs-136	7.1698e+001	2.6528e+012	1.0860e-002	4.0182e+002
Cs-137	1.7205e+002	6.3658e+012	2.6060e-002	9.6422e+002
I-131	1.6710e+003	6.1826e+013	2.5310e-001	9.3647e+003
I-132	5.8171e+002	2.1523e+013	8.8110e-002	3.2601e+003
I-133	2.7167e+003	1.0052e+014	4.1150e-001	1.5225e+004
I-134	7.0048e+000	2.5918e+011	1.0610e-003	3.9257e+001
I-135	1.4551e+003	5.3838e+013	2.2040e-001	8.1548e+003
Kr-85	3.5024e+002	1.2959e+013	5.3050e-002	1.9629e+003
Kr-85m	1.8407e+003	6.8104e+013	2.7880e-001	1.0316e+004

DOS File: S6RBCR.MS5
Run Date: June 25, 2008
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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87	1.6208e+002	5.9970e+012	2.4550e-002	9.0835e+002
Kr-88	2.5055e+003	9.2703e+013	3.7950e-001	1.4041e+004
La-140	1.8308e+001	6.7738e+011	2.7730e-003	1.0260e+002
La-141	3.3862e-001	1.2529e+010	5.1290e-005	1.8977e+000
La-142	3.7275e-002	1.3792e+009	5.6460e-006	2.0890e-001
Mo-99	1.8129e+001	6.7078e+011	2.7460e-003	1.0160e+002
Nb-95	1.4987e+000	5.5451e+010	2.2700e-004	8.3990e+000
Nd-147	5.5484e-001	2.0529e+010	8.4040e-005	3.1095e+000
Np-239	3.7533e+001	1.3887e+012	5.6850e-003	2.1035e+002
Pr-143	1.2808e+000	4.7390e+010	1.9400e-004	7.1780e+000
Pr-144	2.9070e+000	1.0756e+011	4.4031e-004	1.6292e+001
Pu-238	8.8930e-003	3.2904e+008	1.3470e-006	4.9839e-002
Pu-239	9.4541e-004	3.4980e+007	1.4320e-007	5.2984e-003
Pu-240	1.5191e-003	5.6208e+007	2.3010e-007	8.5137e-003
Pu-241	3.7460e-001	1.3860e+010	5.6740e-005	2.0994e+000
Rb-86	2.1311e+000	7.8852e+010	3.2280e-004	1.1944e+001
Rh-103m	1.6659e+001	6.1639e+011	2.5233e-003	9.3364e+001
Rh-105	1.0200e+001	3.7741e+011	1.5450e-003	5.7165e+001
Rh-106	6.6879e+000	2.4745e+011	1.0130e-003	3.7481e+001
Ru-103	1.6703e+001	6.1802e+011	2.5300e-003	9.3610e+001
Ru-105	3.3294e+000	1.2319e+011	5.0430e-004	1.8659e+001
Ru-106	6.6879e+000	2.4745e+011	1.0130e-003	3.7481e+001
Sb-127	1.7271e+001	6.3903e+011	2.6160e-003	9.6792e+001
Sb-129	1.8770e+001	6.9448e+011	2.8430e-003	1.0519e+002
Sr-89	7.9885e+001	2.9557e+012	1.2100e-002	4.4770e+002
Sr-90	1.0233e+001	3.7863e+011	1.5500e-003	5.7350e+001
Sr-91	5.7075e+001	2.1118e+012	8.6450e-003	3.1986e+002
Sr-92	1.4036e+001	5.1933e+011	2.1260e-003	7.8662e+001
Tc-99m	1.6967e+001	6.2779e+011	2.5700e-003	9.5090e+001
Te-127	1.7944e+001	6.6394e+011	2.7180e-003	1.0057e+002
Te-127m	3.1010e+000	1.1474e+011	4.6970e-004	1.7379e+001
Te-129	2.8891e+001	1.0690e+012	4.3760e-003	1.6191e+002
Te-129m	1.2953e+001	4.7927e+011	1.9620e-003	7.2594e+001
Te-131m	3.4872e+001	1.2903e+012	5.2820e-003	1.9543e+002
Te-132	2.8006e+002	1.0362e+013	4.2420e-002	1.5695e+003
Xe-133	4.9350e+004	1.8260e+015	7.4750e+000	2.7658e+005
Xe-135	1.7680e+004	6.5417e+014	2.6780e+000	9.9086e+004
Y-90	8.3054e-001	3.0730e+010	1.2580e-004	4.6546e+000
Y-91	1.1468e+000	4.2431e+010	1.7370e-004	6.4269e+000
Y-92	2.3827e+001	8.8159e+011	3.6090e-003	1.3353e+002
Y-93	4.8182e-001	1.7827e+010	7.2980e-005	2.7003e+000
Zr-95	1.4934e+000	5.5255e+010	2.2620e-004	8.3694e+000
Zr-97	1.0682e+000	3.9524e+010	1.6180e-004	5.9866e+000

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

DOS File: S6RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:53:51 AM
Duration: 00:00:22

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.192e+07	0.000e+00	8.229e-28	0.000e+00	7.059e-29
0.02	1.220e+11	0.000e+00	4.599e-24	0.000e+00	1.593e-25
0.03	9.238e+14	4.357e-103	6.604e-19	4.318e-105	6.545e-21
0.04	3.179e+11	1.608e-52	2.007e-21	7.109e-55	8.874e-24
0.05	1.362e+12	1.314e-32	7.807e-20	3.501e-35	2.080e-22
0.06	3.677e+11	1.500e-24	1.062e-19	2.979e-27	2.110e-22
0.08	6.720e+14	4.388e-14	6.775e-10	6.943e-17	1.072e-12
0.1	1.707e+12	9.960e-14	1.311e-09	1.524e-16	2.006e-12
0.15	5.779e+13	4.258e-09	2.967e-05	7.012e-12	4.885e-08
0.2	6.250e+14	1.639e-06	5.374e-03	2.893e-09	9.485e-06
0.3	1.961e+13	3.981e-06	3.984e-03	7.552e-09	7.557e-06
0.4	6.410e+13	2.258e-04	9.679e-02	4.400e-07	1.886e-04
0.5	1.023e+14	2.987e-03	6.907e-01	5.864e-06	1.356e-03
0.6	7.108e+13	1.092e-02	1.569e+00	2.132e-05	3.063e-03
0.8	6.125e+13	1.154e-01	8.341e+00	2.195e-04	1.587e-02
1.0	4.315e+13	5.141e-01	2.280e+01	9.477e-04	4.202e-02
1.5	5.305e+13	1.388e+01	2.856e+02	2.335e-02	4.805e-01
2.0	6.328e+13	1.133e+02	1.469e+03	1.752e-01	2.272e+00
3.0	1.578e+12	2.844e+01	2.171e+02	3.859e-02	2.945e-01
4.0	3.620e+07	2.557e-03	1.424e-02	3.163e-06	1.762e-05
TOTALS:	2.762e+15	1.563e+02	2.005e+03	2.384e-01	3.110e+00

Results - Dose Point # 2 - (4099.56,430.53,0) cm

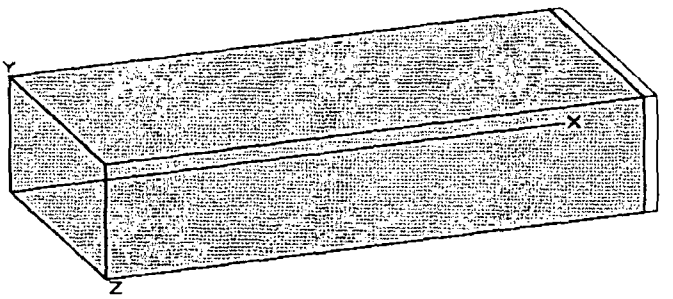
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	6.192e+07	0.000e+00	5.360e-28	0.000e+00	4.597e-29
0.02	1.220e+11	0.000e+00	2.996e-24	0.000e+00	1.038e-25
0.03	9.238e+14	2.165e-103	4.301e-19	2.146e-105	4.263e-21
0.04	3.179e+11	7.980e-53	1.307e-21	3.529e-55	5.780e-24
0.05	1.362e+12	6.557e-33	5.084e-20	1.747e-35	1.354e-22
0.06	3.677e+11	7.523e-25	6.885e-20	1.494e-27	1.368e-22
0.08	6.720e+14	2.219e-14	3.436e-10	3.512e-17	5.438e-13
0.1	1.707e+12	5.065e-14	6.690e-10	7.749e-17	1.023e-12
0.15	5.779e+13	2.182e-09	1.528e-05	3.593e-12	2.517e-08
0.2	6.250e+14	8.444e-07	2.784e-03	1.490e-09	4.914e-06
0.3	1.961e+13	2.067e-06	2.081e-03	3.920e-09	3.947e-06
0.4	6.410e+13	1.179e-04	5.087e-02	2.298e-07	9.912e-05
0.5	1.023e+14	1.569e-03	3.650e-01	3.079e-06	7.164e-04
0.6	7.108e+13	5.760e-03	8.332e-01	1.124e-05	1.626e-03
0.8	6.125e+13	6.136e-02	4.464e+00	1.167e-04	8.490e-03
1.0	4.315e+13	2.752e-01	1.228e+01	5.072e-04	2.264e-02
1.5	5.305e+13	7.525e+00	1.559e+02	1.266e-02	2.623e-01
2.0	6.328e+13	6.201e+01	8.096e+02	9.589e-02	1.252e+00
3.0	1.578e+12	1.577e+01	1.212e+02	2.139e-02	1.644e-01
4.0	3.620e+07	1.429e-03	8.014e-03	1.768e-06	9.914e-06
TOTALS:	2.762e+15	8.565e+01	1.105e+03	1.306e-01	1.712e+00

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

Page : 1
DOS File: S7RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:54:14 AM
Duration: 00:00:22

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

Case Title: Case 7 RB-CR
Description: REACTOR BUILDING TO CONTROL RM-SOURCE BF - 16.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	1.0352e-004	3.8302e+006	1.5680e-008	5.8016e-004
Ba-137m	8.4440e+001	3.1243e+012	1.2790e-002	4.7323e+002
Ba-139	2.5345e-002	9.3778e+008	3.8390e-006	1.4204e-001
Ba-140	7.6584e+001	2.8336e+012	1.1600e-002	4.2920e+002
Ce-141	1.8010e+000	6.6639e+010	2.7280e-004	1.0094e+001
Ce-143	1.2088e+000	4.4727e+010	1.8310e-004	6.7747e+000
Ce-144	1.5304e+000	5.6623e+010	2.3180e-004	8.5766e+000
Cm-242	2.6897e-002	9.9518e+008	4.0740e-006	1.5074e-001
Cm-244	1.5805e-003	5.8480e+007	2.3940e-007	8.8578e-003
Co-58	2.9841e-002	1.1041e+009	4.5200e-006	1.6724e-001
Co-60	1.6162e-002	5.9799e+008	2.4480e-006	9.0576e-002
Cs-134	1.1851e+002	4.3848e+012	1.7950e-002	6.6415e+002
Cs-136	3.6556e+001	1.3526e+012	5.5370e-003	2.0487e+002
Cs-137	8.9260e+001	3.3026e+012	1.3520e-002	5.0024e+002
I-131	1.3554e+003	5.0150e+013	2.0530e-001	7.5961e+003
I-132	1.9001e+002	7.0303e+012	2.8780e-002	1.0649e+003
I-133	1.7495e+003	6.4733e+013	2.6500e-001	9.8050e+003
I-134	1.0543e-002	3.9011e+008	1.5970e-006	5.9089e-002
I-135	5.2856e+002	1.9557e+013	8.0060e-002	2.9622e+003
Kr-85	5.7299e+002	2.1201e+013	8.6790e-002	3.2112e+003
Kr-85m	8.7345e+002	3.2318e+013	1.3230e-001	4.8951e+003

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87	3.3869e+000	1.2531e+011	5.1300e-004	1.8981e+001
Kr-88	5.8164e+002	2.1521e+013	8.8100e-002	3.2597e+003
La-140	1.8261e+001	6.7567e+011	2.7660e-003	1.0234e+002
La-141	4.2887e-002	1.5868e+009	6.4960e-006	2.4035e-001
La-142	5.3054e-004	1.9630e+007	8.0360e-008	2.9733e-003
Mo-99	8.6553e+000	3.2025e+011	1.3110e-003	4.8507e+001
Nb-95	7.7772e-001	2.8776e+010	1.1780e-004	4.3586e+000
Nd-147	2.8211e-001	1.0438e+010	4.2730e-005	1.5810e+000
Np-239	1.7667e+001	6.5368e+011	2.6760e-003	9.9012e+001
Pr-143	6.7605e-001	2.5014e+010	1.0240e-004	3.7888e+000
Pr-144	1.5085e+000	5.5813e+010	2.2849e-004	8.4540e+000
Pu-238	4.6181e-003	1.7087e+008	6.9950e-007	2.5881e-002
Pu-239	4.9146e-004	1.8184e+007	7.4440e-008	2.7543e-003
Pu-240	7.8895e-004	2.9191e+007	1.1950e-007	4.4215e-003
Pu-241	1.9450e-001	7.1964e+009	2.9460e-005	1.0900e+000
Rb-86	1.0920e+000	4.0403e+010	1.6540e-004	6.1198e+000
Rh-103m	8.5996e+000	3.1819e+011	1.3026e-003	4.8195e+001
Rh-105	4.6690e+000	1.7275e+011	7.0720e-004	2.6166e+001
Rh-106	3.4694e+000	1.2837e+011	5.2550e-004	1.9444e+001
Ru-103	8.6223e+000	3.1902e+011	1.3060e-003	4.8322e+001
Ru-105	4.9588e-001	1.8348e+010	7.5110e-005	2.7791e+000
Ru-106	3.4694e+000	1.2837e+011	5.2550e-004	1.9444e+001
Sb-127	8.4440e+000	3.1243e+011	1.2790e-003	4.7323e+001
Sb-129	2.7002e+000	9.9909e+010	4.0900e-004	1.5133e+001
Sr-89	4.1302e+001	1.5282e+012	6.2560e-003	2.3147e+002
Sr-90	5.3127e+000	1.9657e+011	8.0470e-004	2.9774e+001
Sr-91	1.6532e+001	6.1167e+011	2.5040e-003	9.2648e+001
Sr-92	9.4211e-001	3.4858e+010	1.4270e-004	5.2799e+000
Tc-99m	8.4110e+000	3.1121e+011	1.2740e-003	4.7138e+001
Te-127	9.1108e+000	3.3710e+011	1.3800e-003	5.1060e+001
Te-127m	1.6102e+000	5.9579e+010	2.4390e-004	9.0243e+000
Te-129	9.1637e+000	3.3906e+011	1.3880e-003	5.1356e+001
Te-129m	6.6879e+000	2.4745e+011	1.0130e-003	3.7481e+001
Te-131m	1.5053e+001	5.5695e+011	2.2800e-003	8.4360e+001
Te-132	1.3547e+002	5.0125e+012	2.0520e-002	7.5924e+002
Xe-133	7.8763e+004	2.9142e+015	1.1930e+001	4.4141e+005
Xe-135	2.1259e+004	7.8657e+014	3.2200e+000	1.1914e+005
Y-90	8.3780e-001	3.0999e+010	1.2690e-004	4.6953e+000
Y-91	6.3010e-001	2.3314e+010	9.5440e-005	3.5313e+000
Y-92	4.5548e+000	1.6853e+011	6.8990e-004	2.5526e+001
Y-93	1.4445e-001	5.3448e+009	2.1880e-005	8.0956e-001
Zr-95	7.7244e-001	2.8580e+010	1.1700e-004	4.3290e+000
Zr-97	3.9942e-001	1.4779e+010	6.0500e-005	2.2385e+000

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

DOS File: S7RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:54:14 AM
Duration: 00:00:22

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.850e+07	0.000e+00	3.789e-28	0.000e+00	3.250e-29
0.02	6.086e+10	0.000e+00	2.295e-24	0.000e+00	7.950e-26
0.03	1.445e+15	6.818e-103	1.033e-18	6.757e-105	1.024e-20
0.04	1.592e+11	8.050e-53	1.005e-21	3.560e-55	4.444e-24
0.05	6.591e+11	6.357e-33	3.777e-20	1.694e-35	1.006e-22
0.06	1.858e+11	7.579e-25	5.369e-20	1.505e-27	1.067e-22
0.08	1.071e+15	6.993e-14	1.080e-09	1.107e-16	1.709e-12
0.1	7.618e+11	4.444e-14	5.851e-10	6.798e-17	8.952e-13
0.15	2.812e+13	2.072e-09	1.443e-05	3.411e-12	2.377e-08
0.2	7.202e+14	1.889e-06	6.193e-03	3.334e-09	1.093e-05
0.3	1.052e+13	2.136e-06	2.137e-03	4.051e-09	4.054e-06
0.4	4.773e+13	1.682e-04	7.207e-02	3.276e-07	1.404e-04
0.5	6.259e+13	1.828e-03	4.226e-01	3.588e-06	8.295e-04
0.6	4.660e+13	7.161e-03	1.029e+00	1.398e-05	2.009e-03
0.8	2.386e+13	4.497e-02	3.250e+00	8.554e-05	6.182e-03
1.0	1.544e+13	1.840e-01	8.157e+00	3.391e-04	1.504e-02
1.5	1.791e+13	4.685e+00	9.639e+01	7.882e-03	1.622e-01
2.0	1.550e+13	2.776e+01	3.599e+02	4.292e-02	5.566e-01
3.0	2.076e+11	3.742e+00	2.856e+01	5.077e-03	3.874e-02
4.0	5.153e+05	3.639e-05	2.027e-04	4.502e-08	2.507e-07
TOTALS:	3.507e+15	3.642e+01	4.978e+02	5.632e-02	7.817e-01

Results - Dose Point # 2 - (4099.56,430.53,0) cm

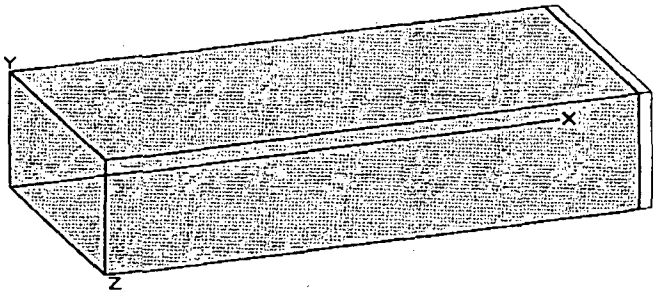
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.850e+07	0.000e+00	2.467e-28	0.000e+00	2.116e-29
0.02	6.086e+10	0.000e+00	1.495e-24	0.000e+00	5.178e-26
0.03	1.445e+15	3.388e-103	6.730e-19	3.358e-105	6.670e-21
0.04	1.592e+11	3.996e-53	6.544e-22	1.767e-55	2.894e-24
0.05	6.591e+11	3.172e-33	2.460e-20	8.450e-36	6.553e-23
0.06	1.858e+11	3.802e-25	3.480e-20	7.552e-28	6.912e-23
0.08	1.071e+15	3.537e-14	5.476e-10	5.597e-17	8.666e-13
0.1	7.618e+11	2.260e-14	2.985e-10	3.457e-17	4.566e-13
0.15	2.812e+13	1.062e-09	7.436e-06	1.748e-12	1.225e-08
0.2	7.202e+14	9.731e-07	3.209e-03	1.717e-09	5.663e-06
0.3	1.052e+13	1.109e-06	1.116e-03	2.103e-09	2.117e-06
0.4	4.773e+13	8.783e-05	3.788e-02	1.711e-07	7.381e-05
0.5	6.259e+13	9.596e-04	2.233e-01	1.884e-06	4.383e-04
0.6	4.660e+13	3.777e-03	5.463e-01	7.372e-06	1.066e-03
0.8	2.386e+13	2.391e-02	1.739e+00	4.548e-05	3.308e-03
1.0	1.544e+13	9.845e-02	4.395e+00	1.815e-04	8.101e-03
1.5	1.791e+13	2.540e+00	5.261e+01	4.273e-03	8.852e-02
2.0	1.550e+13	1.519e+01	1.983e+02	2.349e-02	3.067e-01
3.0	2.076e+11	2.074e+00	1.594e+01	2.814e-03	2.162e-02
4.0	5.153e+05	2.034e-05	1.141e-04	2.516e-08	1.411e-07
TOTALS:	3.507e+15	1.993e+01	2.738e+02	3.081e-02	4.298e-01

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

Page : 1
DOS File: S8RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:54:38 AM
Duration: 00:00:31

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

Case Title: Case 8 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -AOURCE BF- 24.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	5.3371e-005	1.9747e+006	8.0840e-009	2.9911e-004
Ba-137m	4.3400e+001	1.6058e+012	6.5738e-003	2.4323e+002
Ba-139	2.3318e-004	8.6278e+006	3.5320e-008	1.3068e-003
Ba-140	3.8681e+001	1.4312e+012	5.8590e-003	2.1678e+002
Ce-141	9.1967e-001	3.4028e+010	1.3930e-004	5.1541e+000
Ce-143	5.2539e-001	1.9439e+010	7.9580e-005	2.9445e+000
Ce-144	7.8564e-001	2.9069e+010	1.1900e-004	4.4030e+000
Cm-242	1.3805e-002	5.1078e+008	2.0910e-006	7.7367e-002
Cm-244	8.1271e-004	3.0070e+007	1.2310e-007	4.5547e-003
Co-58	1.5290e-002	5.6574e+008	2.3160e-006	8.5692e-002
Co-60	8.3054e-003	3.0730e+008	1.2580e-006	4.6546e-002
Cs-134	6.0904e+001	2.2534e+012	9.2250e-003	3.4133e+002
Cs-136	1.8459e+001	6.8300e+011	2.7960e-003	1.0345e+002
Cs-137	4.5878e+001	1.6975e+012	6.9490e-003	2.5711e+002
I-131	1.1811e+003	4.3701e+013	1.7890e-001	6.6193e+003
I-132	9.0448e+001	3.3466e+012	1.3700e-002	5.0690e+002
I-133	1.2016e+003	4.4458e+013	1.8200e-001	6.7340e+003
I-134	1.6928e-005	6.2632e+005	2.5640e-009	9.4868e-005
I-135	2.0480e+002	7.5774e+012	3.1020e-002	1.1477e+003
Kr-85	6.8595e+002	2.5380e+013	1.0390e-001	3.8443e+003
Kr-85m	3.0330e+002	1.1222e+013	4.5940e-002	1.6998e+003

For Information Only
DOS File: S8RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:54:38 AM
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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87	5.1793e-002	1.9163e+009	7.8450e-006	2.9026e-001
Kr-88	9.8833e+001	3.6568e+012	1.4970e-002	5.5389e+002
La-140	1.3244e+001	4.9002e+011	2.0060e-003	7.4222e+001
La-141	5.3774e-003	1.9896e+008	8.1450e-007	3.0136e-002
La-142	7.4735e-006	2.7652e+005	1.1320e-009	4.1884e-005
Mo-99	4.0900e+000	1.5133e+011	6.1950e-004	2.2921e+001
Nb-95	3.9989e-001	1.4796e+010	6.0570e-005	2.2411e+000
Nd-147	1.4201e-001	5.2544e+009	2.1510e-005	7.9587e-001
Np-239	8.2328e+000	3.0461e+011	1.2470e-003	4.6139e+001
Pr-143	3.5136e-001	1.3000e+010	5.3220e-005	1.9691e+000
Pr-144	7.7441e-001	2.8653e+010	1.1730e-004	4.3400e+000
Pu-238	2.3741e-003	8.7842e+007	3.5960e-007	1.3305e-002
Pu-239	2.5286e-004	9.3558e+006	3.8300e-008	1.4171e-003
Pu-240	4.0550e-004	1.5003e+007	6.1420e-008	2.2725e-003
Pu-241	1.0002e-001	3.7008e+009	1.5150e-005	5.6055e-001
Rb-86	5.5444e-001	2.0514e+010	8.3980e-005	3.1073e+000
Rh-103m	4.3953e+000	1.6263e+011	6.6574e-004	2.4633e+001
Rh-105	2.0724e+000	7.6678e+010	3.1390e-004	1.1614e+001
Rh-106	1.7826e+000	6.5955e+010	2.7000e-004	9.9900e+000
Ru-103	4.4069e+000	1.6305e+011	6.6750e-004	2.4698e+001
Ru-105	7.3085e-002	2.7041e+009	1.1070e-005	4.0959e-001
Ru-106	1.7826e+000	6.5955e+010	2.7000e-004	9.9900e+000
Sb-127	4.0887e+000	1.5128e+011	6.1930e-004	2.2914e+001
Sb-129	3.8464e-001	1.4232e+010	5.8260e-005	2.1556e+000
Sr-89	2.1140e+001	7.8217e+011	3.2020e-003	1.1847e+002
Sr-90	2.7313e+000	1.0106e+011	4.1370e-004	1.5307e+001
Sr-91	4.7409e+000	1.7541e+011	7.1810e-004	2.6570e+001
Sr-92	6.2568e-002	2.3150e+009	9.4770e-006	3.5065e-001
Tc-99m	4.0986e+000	1.5165e+011	6.2080e-004	2.2970e+001
Te-127	4.5647e+000	1.6889e+011	6.9140e-004	2.5582e+001
Te-127m	8.2790e-001	3.0632e+010	1.2540e-004	4.6398e+000
Te-129	3.4938e+000	1.2927e+011	5.2920e-004	1.9580e+001
Te-129m	3.4159e+000	1.2639e+011	5.1740e-004	1.9144e+001
Te-131m	6.4311e+000	2.3795e+011	9.7410e-004	3.6042e+001
Te-132	6.4872e+001	2.4003e+012	9.8260e-003	3.6356e+002
Xe-133	9.1901e+004	3.4003e+015	1.3920e+001	5.1504e+005
Xe-135	1.7350e+004	6.4196e+014	2.6280e+000	9.7236e+004
Y-90	6.2271e-001	2.3040e+010	9.4320e-005	3.4898e+000
Y-91	3.3327e-001	1.2331e+010	5.0480e-005	1.8678e+000
Y-92	6.2799e-001	2.3236e+010	9.5120e-005	3.5194e+000
Y-93	4.2894e-002	1.5871e+009	6.4970e-006	2.4039e-001
Zr-95	3.9566e-001	1.4639e+010	5.9930e-005	2.2174e+000
Zr-97	1.4789e-001	5.4718e+009	2.2400e-005	8.2880e-001

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

DOS File: S8RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:54:38 AM
Duration: 00:00:31

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.358e+07	0.000e+00	1.805e-28	0.000e+00	1.548e-29
0.02	3.009e+10	0.000e+00	1.135e-24	0.000e+00	3.931e-26
0.03	1.668e+15	7.869e-103	1.193e-18	7.799e-105	1.182e-20
0.04	7.936e+10	4.013e-53	5.009e-22	1.775e-55	2.215e-24
0.05	3.156e+11	3.045e-33	1.809e-20	8.110e-36	4.818e-23
0.06	9.309e+10	3.797e-25	2.690e-20	7.542e-28	5.343e-23
0.08	1.249e+15	8.156e-14	1.259e-09	1.291e-16	1.993e-12
0.1	3.437e+11	2.005e-14	2.640e-10	3.068e-17	4.039e-13
0.15	1.082e+13	7.972e-10	5.555e-06	1.313e-12	9.147e-09
0.2	5.831e+14	1.529e-06	5.014e-03	2.699e-09	8.849e-06
0.3	5.774e+12	1.172e-06	1.173e-03	2.223e-09	2.225e-06
0.4	4.013e+13	1.414e-04	6.059e-02	2.755e-07	1.181e-04
0.5	4.196e+13	1.225e-03	2.833e-01	2.405e-06	5.561e-04
0.6	3.239e+13	4.977e-03	7.152e-01	9.714e-06	1.396e-03
0.8	1.187e+13	2.237e-02	1.616e+00	4.254e-05	3.074e-03
1.0	6.425e+12	7.655e-02	3.394e+00	1.411e-04	6.257e-03
1.5	6.913e+12	1.809e+00	3.721e+01	3.043e-03	6.261e-02
2.0	3.182e+12	5.697e+00	7.387e+01	8.809e-03	1.142e-01
3.0	4.593e+10	8.278e-01	6.317e+00	1.123e-03	8.571e-03
4.0	7.259e+03	5.126e-07	2.855e-06	6.342e-10	3.532e-09
TOTALS:	3.661e+15	8.438e+00	1.235e+02	1.317e-02	1.968e-01

Results - Dose Point # 2 - (4099.56,430.53,0) cm

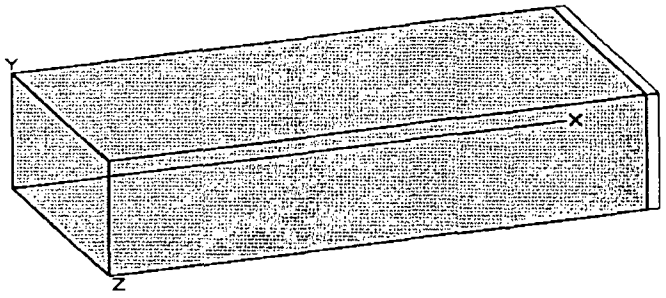
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.358e+07	0.000e+00	1.175e-28	0.000e+00	1.008e-29
0.02	3.009e+10	0.000e+00	7.391e-25	0.000e+00	2.560e-26
0.03	1.668e+15	3.911e-103	7.767e-19	3.876e-105	7.698e-21
0.04	7.936e+10	1.992e-53	3.262e-22	8.811e-56	1.443e-24
0.05	3.156e+11	1.519e-33	1.178e-20	4.047e-36	3.138e-23
0.06	9.309e+10	1.905e-25	1.743e-20	3.783e-28	3.463e-23
0.08	1.249e+15	4.126e-14	6.388e-10	6.529e-17	1.011e-12
0.1	3.437e+11	1.020e-14	1.347e-10	1.560e-17	2.061e-13
0.15	1.082e+13	4.086e-10	2.862e-06	6.728e-13	4.713e-09
0.2	5.831e+14	7.878e-07	2.598e-03	1.390e-09	4.585e-06
0.3	5.774e+12	6.084e-07	6.126e-04	1.154e-09	1.162e-06
0.4	4.013e+13	7.384e-05	3.185e-02	1.439e-07	6.205e-05
0.5	4.196e+13	6.434e-04	1.497e-01	1.263e-06	2.939e-04
0.6	3.239e+13	2.625e-03	3.797e-01	5.124e-06	7.411e-04
0.8	1.187e+13	1.189e-02	8.650e-01	2.262e-05	1.645e-03
1.0	6.425e+12	4.097e-02	1.829e+00	7.552e-05	3.371e-03
1.5	6.913e+12	9.805e-01	2.031e+01	1.650e-03	3.417e-02
2.0	3.182e+12	3.118e+00	4.070e+01	4.821e-03	6.294e-02
3.0	4.593e+10	4.588e-01	3.526e+00	6.225e-04	4.783e-03
4.0	7.259e+03	2.865e-07	1.607e-06	3.545e-10	1.988e-09
TOTALS:	3.661e+15	4.613e+00	6.780e+01	7.198e-03	1.080e-01

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

Page : 1
DOS File: S9RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:55:09 AM
Duration: 00:00:22

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

Case Title: Case 9 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF- 48.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	7.3547e-006	2.7212e+005	1.1140e-009	4.1218e-005
Ba-137m	5.9333e+000	2.1953e+011	8.9870e-004	3.3252e+001
Ba-139	1.8083e-010	6.6907e+000	2.7390e-014	1.0134e-009
Ba-140	5.0090e+000	1.8533e+011	7.5870e-004	2.8072e+001
Ce-141	1.2306e-001	4.5533e+009	1.8640e-005	6.8968e-001
Ce-143	4.3395e-002	1.6056e+009	6.5730e-006	2.4320e-001
Ce-144	1.0722e-001	3.9670e+009	1.6240e-005	6.0088e-001
Cm-242	1.8796e-003	6.9545e+007	2.8470e-007	1.0534e-002
Cm-244	1.1111e-004	4.1112e+006	1.6830e-008	6.2271e-004
Co-58	2.0704e-003	7.6605e+007	3.1360e-007	1.1603e-002
Co-60	1.1356e-003	4.2015e+007	1.7200e-007	6.3640e-003
Cs-134	8.3186e+000	3.0779e+011	1.2600e-003	4.6620e+001
Cs-136	2.3939e+000	8.8575e+010	3.6260e-004	1.3416e+001
Cs-137	6.2720e+000	2.3206e+011	9.5000e-004	3.5150e+001
I-131	6.4595e+002	2.3900e+013	9.7840e-002	3.6201e+003
I-132	1.7436e+001	6.4513e+011	2.6410e-003	9.7717e+001
I-133	3.2178e+002	1.1906e+013	4.8740e-002	1.8034e+003
I-134				
I-135	9.8503e+000	3.6446e+011	1.4920e-003	5.5204e+001
Kr-85	4.3943e+002	1.6259e+013	6.6560e-002	2.4627e+003
Kr-85m	4.7403e+000	1.7539e+011	7.1800e-004	2.6566e+001

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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87	6.9124e-008	2.5576e+003	1.0470e-011	3.8739e-007
Kr-88	1.8103e-001	6.6980e+009	2.7420e-005	1.0145e+000
La-140	2.9518e+000	1.0922e+011	4.4710e-004	1.6543e+001
La-141	1.0669e-005	3.9475e+005	1.6160e-009	5.9792e-005
La-142	2.0823e-011	7.7045e-001	3.1540e-015	1.1670e-010
Mo-99	4.3468e-001	1.6083e+010	6.5840e-005	2.4361e+000
Nb-95	5.4652e-002	2.0221e+009	8.2780e-006	3.0629e-001
Nd-147	1.8228e-002	6.7445e+008	2.7610e-006	1.0216e-001
Np-239	8.3846e-001	3.1023e+010	1.2700e-004	4.6990e+000
Pr-143	4.8459e-002	1.7930e+009	7.3400e-006	2.7158e-001
Pr-144	1.0568e-001	3.9103e+009	1.6008e-005	5.9229e-001
Pu-238	3.2469e-004	1.2013e+007	4.9180e-008	1.8197e-003
Pu-239	3.4654e-005	1.2822e+006	5.2490e-009	1.9421e-004
Pu-240	5.5444e-005	2.0514e+006	8.3980e-009	3.1073e-004
Pu-241	1.3673e-002	5.0590e+008	2.0710e-006	7.6627e-002
Rb-86	7.3019e-002	2.7017e+009	1.1060e-005	4.0922e-001
Rh-103m	5.9052e-001	2.1849e+010	8.9444e-005	3.3094e+000
Rh-105	1.7793e-001	6.5832e+009	2.6950e-005	9.9715e-001
Rh-106	2.4329e-001	9.0016e+009	3.6850e-005	1.3635e+000
Ru-103	5.9207e-001	2.1907e+010	8.9680e-005	3.3182e+000
Ru-105	2.3589e-004	8.7280e+006	3.5730e-008	1.3220e-003
Ru-106	2.4329e-001	9.0016e+009	3.6850e-005	1.3635e+000
Sb-127	4.6696e-001	1.7278e+010	7.0730e-005	2.6170e+000
Sb-129	1.1184e-003	4.1380e+007	1.6940e-007	6.2678e-003
Sr-89	2.8508e+000	1.0548e+011	4.3180e-004	1.5977e+001
Sr-90	3.7341e-001	1.3816e+010	5.6560e-005	2.0927e+000
Sr-91	1.1250e-001	4.1625e+009	1.7040e-005	6.3048e-001
Sr-92	1.8459e-005	6.8300e+005	2.7960e-009	1.0345e-004
Tc-99m	4.4485e-001	1.6459e+010	6.7380e-005	2.4931e+000
Te-127	5.5365e-001	2.0485e+010	8.3860e-005	3.1028e+000
Te-127m	1.1303e-001	4.1820e+009	1.7120e-005	6.3344e-001
Te-129	3.9731e-001	1.4701e+010	6.0180e-005	2.2267e+000
Te-129m	4.5765e-001	1.6933e+010	6.9320e-005	2.5648e+000
Te-131m	5.0512e-001	1.8690e+010	7.6510e-005	2.8309e+000
Te-132	7.1698e+000	2.6528e+011	1.0860e-003	4.0182e+001
Xe-133	5.7841e+004	2.1401e+015	8.7610e+000	3.2416e+005
Xe-135	4.2233e+003	1.5626e+014	6.3970e-001	2.3669e+004
Y-90	1.5158e-001	5.6086e+009	2.2960e-005	8.4952e-001
Y-91	4.6551e-002	1.7224e+009	7.0510e-006	2.6089e-001
Y-92	9.9625e-004	3.6861e+007	1.5090e-007	5.5833e-003
Y-93	1.1296e-003	4.1796e+007	1.7110e-007	6.3307e-003
Zr-95	5.3523e-002	1.9803e+009	8.1070e-006	2.9996e-001
Zr-97	7.5594e-003	2.7970e+008	1.1450e-006	4.2365e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.693e+06	0.000e+00	2.250e-29	0.000e+00	1.930e-30
0.02	3.607e+09	0.000e+00	1.360e-25	0.000e+00	4.712e-27
0.03	1.036e+15	4.887e-103	7.406e-19	4.843e-105	7.340e-21
0.04	1.006e+10	5.085e-54	6.347e-23	2.249e-56	2.807e-25
0.05	3.490e+10	3.366e-34	2.000e-21	8.967e-37	5.327e-24
0.06	1.184e+10	4.829e-26	3.421e-21	9.591e-29	6.795e-24
0.08	7.860e+14	5.132e-14	7.925e-10	8.122e-17	1.254e-12
0.1	3.488e+10	2.035e-15	2.680e-11	3.113e-18	4.099e-14
0.15	6.293e+11	4.636e-11	3.230e-07	7.635e-14	5.319e-10
0.2	1.423e+14	3.733e-07	1.224e-03	6.589e-10	2.160e-06
0.3	1.783e+12	3.619e-07	3.621e-04	6.864e-10	6.869e-07
0.4	2.042e+13	7.194e-05	3.083e-02	1.402e-07	6.008e-05
0.5	1.103e+13	3.222e-04	7.449e-02	6.324e-07	1.462e-04
0.6	8.191e+12	1.259e-03	1.809e-01	2.457e-06	3.530e-04
0.8	2.445e+12	4.607e-03	3.329e-01	8.762e-06	6.332e-04
1.0	7.425e+11	8.847e-03	3.923e-01	1.631e-05	7.231e-04
1.5	7.075e+11	1.851e-01	3.809e+00	3.114e-04	6.408e-03
2.0	6.711e+10	1.202e-01	1.558e+00	1.858e-04	2.409e-03
3.0	3.941e+09	7.102e-02	5.420e-01	9.635e-05	7.353e-04
4.0	2.022e-02	1.428e-12	7.955e-12	1.767e-15	9.841e-15
TOTALS:	2.010e+15	3.914e-01	6.922e+00	6.219e-04	1.147e-02

Results - Dose Point # 2 - (4099.56,430.53,0) cm

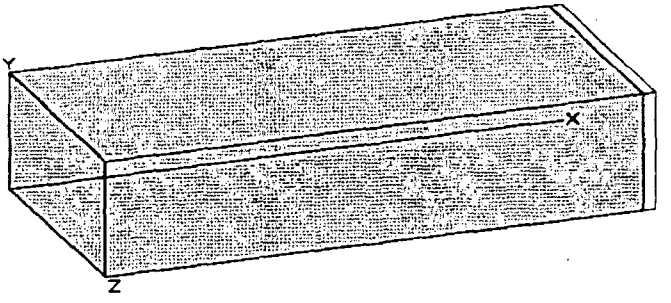
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.693e+06	0.000e+00	1.466e-29	0.000e+00	1.257e-30
0.02	3.607e+09	0.000e+00	8.860e-26	0.000e+00	3.069e-27
0.03	1.036e+15	2.428e-103	4.823e-19	2.407e-105	4.780e-21
0.04	1.006e+10	2.524e-54	4.134e-23	1.116e-56	1.828e-25
0.05	3.490e+10	1.680e-34	1.302e-21	4.474e-37	3.469e-24
0.06	1.184e+10	2.422e-26	2.217e-21	4.811e-29	4.403e-24
0.08	7.860e+14	2.596e-14	4.020e-10	4.108e-17	6.361e-13
0.1	3.488e+10	1.035e-15	1.367e-11	1.583e-18	2.091e-14
0.15	6.293e+11	2.376e-11	1.664e-07	3.913e-14	2.741e-10
0.2	1.423e+14	1.923e-07	6.341e-04	3.394e-10	1.119e-06
0.3	1.783e+12	1.878e-07	1.891e-04	3.563e-10	3.588e-07
0.4	2.042e+13	3.757e-05	1.621e-02	7.321e-08	3.158e-05
0.5	1.103e+13	1.692e-04	3.936e-02	3.321e-07	7.726e-05
0.6	8.191e+12	6.639e-04	9.602e-02	1.296e-06	1.874e-04
0.8	2.445e+12	2.449e-03	1.782e-01	4.658e-06	3.389e-04
1.0	7.425e+11	4.735e-03	2.114e-01	8.728e-06	3.896e-04
1.5	7.075e+11	1.004e-01	2.079e+00	1.689e-04	3.498e-03
2.0	6.711e+10	6.576e-02	8.586e-01	1.017e-04	1.328e-03
3.0	3.941e+09	3.937e-02	3.025e-01	5.341e-05	4.104e-04
4.0	2.022e-02	7.984e-13	4.477e-12	9.877e-16	5.538e-15
TOTALS:	2.010e+15	2.135e-01	3.782e+00	3.390e-04	6.262e-03

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

Page : 1
DOS File: S10RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:50:36 AM
Duration: 00:00:22

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

Case Title: Case 10 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF- 96.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	2.1338e-007	7.8950e+003	3.2320e-011	1.1958e-006
Ba-137m	1.6819e-001	6.2231e+009	2.5476e-005	9.4260e-001
Ba-139				
Ba-140	1.2815e-001	4.7414e+009	1.9410e-005	7.1817e-001
Ce-141	3.3651e-003	1.2451e+008	5.0970e-007	1.8859e-002
Ce-143	4.2801e-004	1.5836e+007	6.4830e-008	2.3987e-003
Ce-144	3.0435e-003	1.1261e+008	4.6100e-007	1.7057e-002
Cm-242	5.3180e-005	1.9676e+006	8.0550e-009	2.9804e-004
Cm-244	3.1690e-006	1.1725e+005	4.8000e-010	1.7760e-005
Co-58	5.7933e-005	2.1435e+006	8.7750e-009	3.2468e-004
Co-60	3.2370e-005	1.1977e+006	4.9030e-009	1.8141e-004
Cs-134	2.3543e-001	8.7109e+009	3.5660e-005	1.3194e+000
Cs-136	6.1049e-002	2.2588e+009	9.2470e-006	3.4214e-001
Cs-137	1.7779e-001	6.5784e+009	2.6930e-005	9.9641e-001
I-131	4.7508e+002	1.7578e+013	7.1960e-002	2.6625e+003
I-132	5.6289e+000	2.0827e+011	8.5260e-004	3.1546e+001
I-133	5.6771e+001	2.1005e+012	8.5990e-003	3.1816e+002
I-134				
I-135	5.6084e-002	2.0751e+009	8.4950e-006	3.1431e-001
Kr-85	3.9777e+002	1.4718e+013	6.0250e-002	2.2293e+003
Kr-85m	2.5550e-003	9.4535e+007	3.8700e-007	1.4319e-002

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Run Date: June 25, 2008
Run Time: 9:50:36 AM
Duration: 00:00:22

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87				
Kr-88	1.3389e-006	4.9539e+004	2.0280e-010	7.5036e-006
La-140	1.1309e-001	4.1844e+009	1.7130e-005	6.3381e-001
La-141	6.4080e-011	2.3709e+000	9.7060e-015	3.5912e-010
La-142				
Mo-99	7.4933e-003	2.7725e+008	1.1350e-006	4.1995e-002
Nb-95	1.5568e-003	5.7600e+007	2.3580e-007	8.7246e-003
Nd-147	4.5845e-004	1.6963e+007	6.9440e-008	2.5693e-003
Np-239	1.3283e-002	4.9148e+008	2.0120e-006	7.4444e-002
Pr-143	1.3237e-003	4.8977e+007	2.0050e-007	7.4185e-003
Pr-144	3.0000e-003	1.1100e+008	4.5441e-007	1.6813e-002
Pu-238	9.2627e-006	3.4272e+005	1.4030e-009	5.1911e-005
Pu-239	9.9163e-007	3.6690e+004	1.5020e-010	5.5574e-006
Pu-240	1.5819e-006	5.8529e+004	2.3960e-010	8.8652e-006
Pu-241	3.8992e-004	1.4427e+007	5.9060e-008	2.1852e-003
Rb-86	1.9219e-003	7.1109e+007	2.9110e-007	1.0771e-002
Rh-103m	1.6264e-002	6.0178e+008	2.4635e-006	9.1150e-002
Rh-105	1.9819e-003	7.3332e+007	3.0020e-007	1.1107e-002
Rh-106	6.9124e-003	2.5576e+008	1.0470e-006	3.8739e-002
Ru-103	1.6307e-002	6.0336e+008	2.4700e-006	9.1390e-002
Ru-105	3.7467e-009	1.3863e+002	5.6750e-013	2.0998e-008
Ru-106	6.9124e-003	2.5576e+008	1.0470e-006	3.8739e-002
Sb-127	9.2957e-003	3.4394e+008	1.4080e-006	5.2096e-002
Sb-129	1.4425e-008	5.3374e+002	2.1850e-012	8.0845e-008
Sr-89	7.9159e-002	2.9289e+009	1.1990e-005	4.4363e-001
Sr-90	1.0656e-002	3.9426e+008	1.6140e-006	5.9718e-002
Sr-91	9.6720e-005	3.5786e+006	1.4650e-008	5.4205e-004
Sr-92				
Tc-99m	7.6782e-003	2.8409e+008	1.1630e-006	4.3031e-002
Te-127	1.2062e-002	4.4629e+008	1.8270e-006	6.7599e-002
Te-127m	3.2099e-003	1.1877e+008	4.8620e-007	1.7989e-002
Te-129	1.0834e-002	4.0086e+008	1.6410e-006	6.0717e-002
Te-129m	1.2531e-002	4.6364e+008	1.8980e-006	7.0226e-002
Te-131m	4.7541e-003	1.7590e+008	7.2010e-007	2.6644e-002
Te-132	1.3369e-001	4.9466e+009	2.0250e-005	7.4925e-001
Xe-133	4.3686e+004	1.6164e+015	6.6170e+000	2.4483e+005
Xe-135	1.4313e+002	5.2959e+012	2.1680e-002	8.0216e+002
Y-90	6.9124e-003	2.5576e+008	1.0470e-006	3.8739e-002
Y-91	1.3052e-003	4.8293e+007	1.9770e-007	7.3149e-003
Y-92	2.5002e-009	9.2507e+001	3.7870e-013	1.4012e-008
Y-93	1.1956e-006	4.4238e+004	1.8110e-010	6.7007e-006
Zr-95	1.4947e-003	5.5304e+007	2.2640e-007	8.3768e-003
Zr-97	3.0112e-005	1.1141e+006	4.5610e-009	1.6876e-004

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

DOS File: S10RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:50:36 AM
Duration: 00:00:22

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.717e+04	0.000e+00	6.269e-31	0.000e+00	5.377e-32
0.02	8.135e+07	0.000e+00	3.068e-27	0.000e+00	1.063e-28
0.03	7.765e+14	3.663e-103	5.551e-19	3.630e-105	5.501e-21
0.04	2.565e+08	1.297e-55	1.619e-24	5.737e-58	7.161e-27
0.05	6.513e+08	6.283e-36	3.732e-23	1.674e-38	9.943e-26
0.06	2.943e+08	1.200e-27	8.504e-23	2.384e-30	1.689e-25
0.08	5.937e+14	3.876e-14	5.985e-10	6.134e-17	9.472e-13
0.1	5.824e+08	3.397e-17	4.473e-13	5.198e-20	6.844e-16
0.15	1.684e+10	1.241e-12	8.645e-09	2.043e-15	1.424e-11
0.2	5.963e+12	1.564e-08	5.128e-05	2.761e-11	9.050e-08
0.3	1.168e+12	2.372e-07	2.373e-04	4.499e-10	4.502e-07
0.4	1.432e+13	5.043e-05	2.162e-02	9.827e-08	4.212e-05
0.5	2.045e+12	5.971e-05	1.381e-02	1.172e-07	2.710e-05
0.6	1.787e+12	2.745e-04	3.945e-02	5.358e-07	7.700e-05
0.8	6.908e+11	1.302e-03	9.407e-02	2.476e-06	1.789e-04
1.0	1.152e+11	1.373e-03	6.087e-02	2.530e-06	1.122e-04
1.5	8.959e+10	2.344e-02	4.823e-01	3.944e-05	8.114e-04
2.0	7.117e+09	1.274e-02	1.652e-01	1.971e-05	2.555e-04
3.0	1.490e+08	2.685e-03	2.049e-02	3.643e-06	2.780e-05
TOTALS:	1.396e+15	4.193e-02	8.981e-01	6.854e-05	1.533e-03

Results - Dose Point # 2 - (4099.56,430.53,0) cm

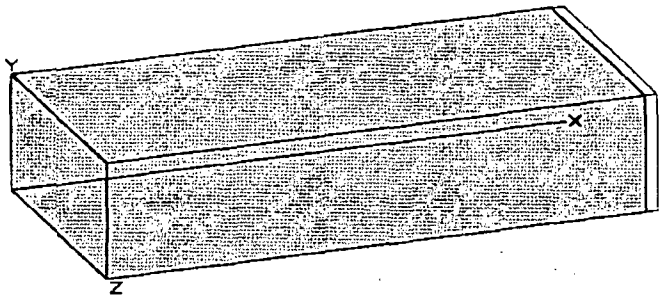
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.717e+04	0.000e+00	4.083e-31	0.000e+00	3.502e-32
0.02	8.135e+07	0.000e+00	1.998e-27	0.000e+00	6.921e-29
0.03	7.765e+14	1.820e-103	3.615e-19	1.804e-105	3.583e-21
0.04	2.565e+08	6.439e-56	1.054e-24	2.848e-58	4.664e-27
0.05	6.513e+08	3.135e-36	2.431e-23	8.351e-39	6.476e-26
0.06	2.943e+08	6.022e-28	5.512e-23	1.196e-30	1.095e-25
0.08	5.937e+14	1.961e-14	3.036e-10	3.103e-17	4.804e-13
0.1	5.824e+08	1.728e-17	2.282e-13	2.643e-20	3.491e-16
0.15	1.684e+10	6.359e-13	4.454e-09	1.047e-15	7.335e-12
0.2	5.963e+12	8.057e-09	2.657e-05	1.422e-11	4.689e-08
0.3	1.168e+12	1.231e-07	1.240e-04	2.335e-10	2.351e-07
0.4	1.432e+13	2.634e-05	1.136e-02	5.132e-08	2.214e-05
0.5	2.045e+12	3.135e-05	7.295e-03	6.154e-08	1.432e-05
0.6	1.787e+12	1.448e-04	2.094e-02	2.826e-07	4.088e-05
0.8	6.908e+11	6.920e-04	5.034e-02	1.316e-06	9.575e-05
1.0	1.152e+11	7.346e-04	3.279e-02	1.354e-06	6.045e-05
1.5	8.959e+10	1.271e-02	2.632e-01	2.138e-05	4.429e-04
2.0	7.117e+09	6.974e-03	9.105e-02	1.078e-05	1.408e-04
3.0	1.490e+08	1.488e-03	1.144e-02	2.019e-06	1.552e-05
TOTALS:	1.396e+15	2.280e-02	4.886e-01	3.725e-05	8.330e-04

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

Page : 1
DOS File: S11RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:50:59 AM
Duration: 00:00:22

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

Case Title: Case 11 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF- 240.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	6.8331e-008	2.5283e+003	1.0350e-011	3.8295e-007
Ba-137m	5.0795e-002	1.8794e+009	7.6938e-006	2.8467e-001
Ba-139				
Ba-140	2.8270e-002	1.0460e+009	4.2820e-006	1.5843e-001
Ce-141	9.0514e-004	3.3490e+007	1.3710e-007	5.0727e-003
Ce-143	6.7077e-006	2.4818e+005	1.0160e-009	3.7592e-005
Ce-144	9.1703e-004	3.3930e+007	1.3890e-007	5.1393e-003
Cm-242	1.5845e-005	5.8626e+005	2.4000e-009	8.8800e-005
Cm-244	9.6786e-007	3.5811e+004	1.4660e-010	5.4242e-006
Co-58	1.6697e-005	6.1777e+005	2.5290e-009	9.3573e-005
Co-60	9.8701e-006	3.6519e+005	1.4950e-009	5.5315e-005
Cs-134	7.0708e-002	2.6162e+009	1.0710e-005	3.9627e-001
Cs-136	1.3429e-002	4.9686e+008	2.0340e-006	7.5258e-002
Cs-137	5.3695e-002	1.9867e+009	8.1330e-006	3.0092e-001
I-131	2.6124e+002	9.6660e+012	3.9570e-002	1.4641e+003
I-132	1.2947e+000	4.7903e+010	1.9610e-004	7.2557e+000
I-133	4.3144e-001	1.5963e+010	6.5350e-005	2.4180e+000
I-134				
I-135	1.4313e-008	5.2959e+002	2.1680e-012	8.0216e-008
Kr-85	3.8523e+002	1.4254e+013	5.8350e-002	2.1590e+003
Kr-85m				

DOS File: S11RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:50:59 AM
Duration: 00:00:22

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87				
Kr-88				
La-140	3.1914e-001	1.1808e+010	4.8340e-005	1.7886e+000
La-141				
La-142				
Mo-99	5.0466e-004	1.8672e+007	7.6440e-008	2.8283e-003
Nb-95	4.7165e-004	1.7451e+007	7.1440e-008	2.6433e-003
Nd-147	9.5928e-005	3.5493e+006	1.4530e-008	5.3761e-004
Np-239	6.9454e-004	2.5698e+007	1.0520e-007	3.8924e-003
Pr-143	3.0838e-004	1.1410e+007	4.6710e-008	1.7283e-003
Pr-144	9.0391e-004	3.3445e+007	1.3691e-007	5.0658e-003
Pu-238	2.8336e-006	1.0484e+005	4.2920e-010	1.5880e-005
Pu-239	3.0396e-007	1.1246e+004	4.6040e-011	1.7035e-006
Pu-240	4.8353e-007	1.7891e+004	7.3240e-011	2.7099e-006
Pu-241	1.1910e-004	4.4067e+006	1.8040e-008	6.6748e-004
Rb-86	4.6472e-004	1.7195e+007	7.0390e-008	2.6044e-003
Rh-103m	4.4717e-003	1.6545e+008	6.7731e-007	2.5061e-002
Rh-105	3.6001e-005	1.3320e+006	5.4530e-009	2.0176e-004
Rh-106	2.0896e-003	7.7313e+007	3.1650e-007	1.1710e-002
Ru-103	4.4835e-003	1.6589e+008	6.7910e-007	2.5127e-002
Ru-105				
Ru-106	2.0896e-003	7.7313e+007	3.1650e-007	1.1710e-002
Sb-127	9.6456e-004	3.5689e+007	1.4610e-007	5.4057e-003
Sb-129				
Sr-89	2.2275e-002	8.2419e+008	3.3740e-006	1.2484e-001
Sr-90	3.2548e-003	1.2043e+008	4.9300e-007	1.8241e-002
Sr-91	8.0875e-010	2.9924e+001	1.2250e-013	4.5325e-009
Sr-92				
Tc-99m	5.1740e-004	1.9144e+007	7.8370e-008	2.8997e-003
Te-127	1.8875e-003	6.9839e+007	2.8590e-007	1.0578e-002
Te-127m	9.5598e-004	3.5371e+007	1.4480e-007	5.3576e-003
Te-129	2.9260e-003	1.0826e+008	4.4320e-007	1.6398e-002
Te-129m	3.3842e-003	1.2522e+008	5.1260e-007	1.8966e-002
Te-131m	5.2163e-005	1.9300e+006	7.9010e-009	2.9234e-004
Te-132	1.1402e-002	4.2186e+008	1.7270e-006	6.3899e-002
Xe-133	1.9040e+004	7.0449e+014	2.8840e+000	1.0671e+005
Xe-135	2.2903e-003	8.4739e+007	3.4690e-007	1.2835e-002
Y-90	3.0290e-003	1.1207e+008	4.5880e-007	1.6976e-002
Y-91	3.7150e-004	1.3745e+007	5.6270e-008	2.0820e-003
Y-92				
Y-93	1.8664e-011	6.9057e-001	2.8270e-015	1.0460e-010
Zr-95	4.2801e-004	1.5836e+007	6.4830e-008	2.3987e-003
Zr-97	2.5061e-008	9.2727e+002	3.7960e-012	1.4045e-007

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

DOS File: S11RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:50:59 AM
Duration: 00:00:22

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.428e+04	0.000e+00	1.898e-31	0.000e+00	1.628e-32
0.02	1.616e+07	0.000e+00	6.096e-28	0.000e+00	2.112e-29
0.03	3.384e+14	1.596e-103	2.419e-19	1.582e-105	2.397e-21
0.04	9.905e+07	5.009e-56	6.252e-25	2.215e-58	2.765e-27
0.05	5.596e+07	5.398e-37	3.207e-24	1.438e-39	8.542e-27
0.06	6.292e+07	2.567e-28	1.818e-23	5.098e-31	3.611e-26
0.08	2.588e+14	1.690e-14	2.609e-10	2.674e-17	4.129e-13
0.1	6.119e+07	3.570e-18	4.700e-14	5.461e-21	7.191e-17
0.15	3.675e+08	2.707e-14	1.886e-10	4.458e-17	3.106e-13
0.2	5.277e+11	1.384e-09	4.537e-06	2.443e-12	8.008e-09
0.3	6.356e+11	1.290e-07	1.291e-04	2.447e-10	2.449e-07
0.4	7.847e+12	2.764e-05	1.185e-02	5.386e-08	2.309e-05
0.5	1.281e+11	3.741e-06	8.650e-04	7.344e-09	1.698e-06
0.6	7.893e+11	1.213e-04	1.743e-02	2.367e-07	3.402e-05
0.8	2.279e+11	4.294e-04	3.103e-02	8.167e-07	5.902e-05
1.0	1.628e+10	1.940e-04	8.601e-03	3.576e-07	1.585e-05
1.5	1.914e+10	5.008e-03	1.030e-01	8.425e-06	1.734e-04
2.0	1.675e+09	2.999e-03	3.889e-02	4.638e-06	6.014e-05
3.0	4.205e+08	7.577e-03	5.783e-02	1.028e-05	7.846e-05
TOTALS:	6.074e+14	1.636e-02	2.697e-01	2.482e-05	4.459e-04

Results - Dose Point # 2 - (4099.56,430.53,0) cm

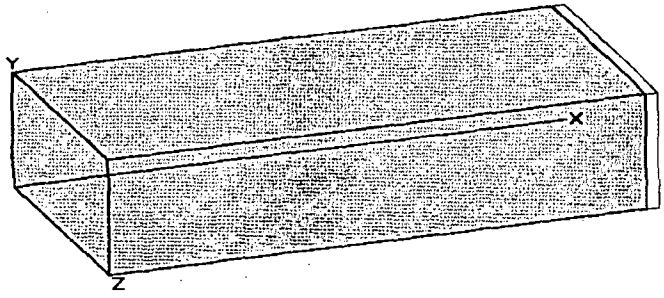
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.428e+04	0.000e+00	1.236e-31	0.000e+00	1.060e-32
0.02	1.616e+07	0.000e+00	3.970e-28	0.000e+00	1.375e-29
0.03	3.384e+14	7.932e-104	1.576e-19	7.861e-106	1.561e-21
0.04	9.905e+07	2.487e-56	4.072e-25	1.100e-58	1.801e-27
0.05	5.596e+07	2.693e-37	2.088e-24	7.175e-40	5.563e-27
0.06	6.292e+07	1.288e-28	1.178e-23	2.557e-31	2.341e-26
0.08	2.588e+14	8.548e-15	1.323e-10	1.353e-17	2.094e-13
0.1	6.119e+07	1.815e-18	2.398e-14	2.777e-21	3.668e-17
0.15	3.675e+08	1.388e-14	9.718e-11	2.285e-17	1.600e-13
0.2	5.277e+11	7.130e-10	2.351e-06	1.258e-12	4.149e-09
0.3	6.356e+11	6.697e-08	6.743e-05	1.270e-10	1.279e-07
0.4	7.847e+12	1.444e-05	6.228e-03	2.813e-08	1.213e-05
0.5	1.281e+11	1.964e-06	4.571e-04	3.856e-09	8.972e-07
0.6	7.893e+11	6.397e-05	9.253e-03	1.249e-07	1.806e-05
0.8	2.279e+11	2.283e-04	1.661e-02	4.342e-07	3.159e-05
1.0	1.628e+10	1.038e-04	4.634e-03	1.914e-07	8.542e-06
1.5	1.914e+10	2.715e-03	5.624e-02	4.568e-06	9.462e-05
2.0	1.675e+09	1.641e-03	2.143e-02	2.538e-06	3.314e-05
3.0	4.205e+08	4.200e-03	3.228e-02	5.699e-06	4.379e-05
TOTALS:	6.074e+14	8.969e-03	1.472e-01	1.359e-05	2.429e-04

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

Page : 1
DOS File: S12RBCR.MS5
Run Date: June 26, 2008
Run Time: 8:22:13 AM
Duration: 00:00:21

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

Case Title: Case 12 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF- 480.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	5.4956e-008	2.0334e+003	8.3241e-012	3.0799e-007
Ba-137m	3.7917e-002	1.4029e+009	5.7432e-006	2.1250e-001
Ba-139				
Ba-140	1.2253e-002	4.5338e+008	1.8560e-006	6.8672e-002
Ce-141	5.4625e-004	2.0211e+007	8.2740e-008	3.0614e-003
Ce-143	3.2403e-008	1.1989e+003	4.9080e-012	1.8160e-007
Ce-144	6.6813e-004	2.4721e+007	1.0120e-007	3.7444e-003
Cm-242	1.1342e-005	4.1967e+005	1.7180e-009	6.3566e-005
Cm-244	7.2226e-007	2.6724e+004	1.0940e-010	4.0478e-006
Co-58	1.1309e-005	4.1844e+005	1.7130e-009	6.3381e-005
Co-60	7.3481e-006	2.7188e+005	1.1130e-009	4.1181e-005
Cs-134	5.2348e-002	1.9369e+009	7.9290e-006	2.9337e-001
Cs-136	5.9088e-003	2.1863e+008	8.9500e-007	3.3115e-002
Cs-137	4.0081e-002	1.4830e+009	6.0710e-006	2.2463e-001
I-131	9.7710e+001	3.6153e+012	1.4800e-002	5.4760e+002
I-132	1.1527e-001	4.2651e+009	1.7460e-005	6.4602e-001
I-133	1.2848e-004	4.7536e+006	1.9460e-008	7.2002e-004
I-134				
I-135				
Kr-85	3.6622e+002	1.3550e+013	5.5470e-002	2.0524e+003
Kr-85m				

DOS File: S12RBCR.MS5
Run Date: June 26, 2008
Run Time: 8:22:13 AM
Duration: 00:00:21

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87				
Kr-88				
La-140	1.4221e-002	5.2617e+008	2.1540e-006	7.9698e-002
La-141				
La-142				
Mo-99	3.0317e-005	1.1217e+006	4.5920e-009	1.6990e-004
Nb-95	3.4284e-004	1.2685e+007	5.1930e-008	1.9214e-003
Nd-147	3.8120e-005	1.4104e+006	5.7740e-009	2.1364e-004
Np-239	2.7333e-005	1.0113e+006	4.1400e-009	1.5318e-004
Pr-143	1.3851e-004	5.1249e+006	2.0980e-008	7.7626e-004
Pr-144	6.5857e-004	2.4367e+007	9.9753e-008	3.6909e-003
Pu-238	2.1186e-006	7.8388e+004	3.2090e-010	1.1873e-005
Pu-239	2.2718e-007	8.4055e+003	3.4410e-011	1.2732e-006
Pu-240	3.6120e-007	1.3364e+004	5.4710e-011	2.0243e-006
Pu-241	8.8864e-005	3.2880e+006	1.3460e-008	4.9802e-004
Rb-86	2.3939e-004	8.8575e+006	3.6260e-008	1.3416e-003
Rh-103m	2.7998e-003	1.0359e+008	4.2408e-007	1.5691e-002
Rh-105	2.4348e-007	9.0089e+003	3.6880e-011	1.3646e-006
Rh-106	1.5317e-003	5.6672e+007	2.3200e-007	8.5840e-003
Ru-103	2.8072e-003	1.0387e+008	4.2520e-007	1.5732e-002
Ru-105				
Ru-106	1.5317e-003	5.6672e+007	2.3200e-007	8.5840e-003
Sb-127	1.1904e-004	4.4043e+006	1.8030e-008	6.6711e-004
Sb-129				
Sr-89	1.4505e-002	5.3667e+008	2.1970e-006	8.1289e-002
Sr-90	2.4296e-003	8.9894e+007	3.6800e-007	1.3616e-002
Sr-91				
Sr-92				
Tc-99m	3.1082e-005	1.1501e+006	4.7080e-009	1.7420e-004
Te-127	8.0017e-004	2.9606e+007	1.2120e-007	4.4844e-003
Te-127m	6.7407e-004	2.4941e+007	1.0210e-007	3.7777e-003
Te-129	1.7786e-003	6.5808e+007	2.6940e-007	9.9678e-003
Te-129m	2.0565e-003	7.6092e+007	3.1150e-007	1.1525e-002
Te-131m	1.5218e-007	5.6306e+003	2.3050e-011	8.5285e-007
Te-132	1.0147e-003	3.7545e+007	1.5370e-007	5.6869e-003
Xe-133	4.6115e+003	1.7063e+014	6.9850e-001	2.5845e+004
Xe-135	1.9978e-011	7.3918e-001	3.0260e-015	1.1196e-010
Y-90	2.4296e-003	8.9894e+007	3.6800e-007	1.3616e-002
Y-91	2.4652e-004	9.1213e+006	3.7340e-008	1.3816e-003
Y-92				
Y-93				
Zr-95	2.8693e-004	1.0616e+007	4.3460e-008	1.6080e-003
Zr-97	9.9361e-013	3.6764e-002	1.5050e-016	5.5685e-012

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

DOS File: S12RBCR.MS5
Run Date: June 26, 2008
Run Time: 8:22:13 AM
Duration: 00:00:21

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.038e+04	0.000e+00	1.379e-31	0.000e+00	1.183e-32
0.02	8.991e+06	0.000e+00	3.391e-28	0.000e+00	1.175e-29
0.03	8.202e+13	3.869e-104	5.863e-20	3.834e-106	5.811e-22
0.04	3.929e+07	1.987e-56	2.480e-25	8.786e-59	1.097e-27
0.05	5.312e+06	5.124e-38	3.044e-25	1.365e-40	8.108e-28
0.06	2.745e+07	1.120e-28	7.932e-24	2.224e-31	1.575e-26
0.08	6.271e+13	4.095e-15	6.323e-11	6.480e-18	1.001e-13
0.1	4.886e+06	2.850e-19	3.753e-15	4.361e-22	5.742e-18
0.15	8.648e+07	6.371e-15	4.439e-11	1.049e-17	7.310e-14
0.2	1.311e+11	3.439e-10	1.127e-06	6.069e-13	1.990e-09
0.3	2.366e+11	4.802e-08	4.805e-05	9.109e-11	9.115e-08
0.4	2.934e+12	1.034e-05	4.431e-03	2.014e-08	8.634e-06
0.5	7.336e+10	2.142e-06	4.953e-04	4.205e-09	9.721e-07
0.6	2.795e+11	4.295e-05	6.172e-03	8.383e-08	1.205e-05
0.8	7.145e+10	1.346e-04	9.731e-03	2.561e-07	1.851e-05
1.0	1.581e+09	1.884e-05	8.356e-04	3.473e-08	1.540e-06
1.5	1.220e+09	3.192e-04	6.568e-03	5.371e-07	1.105e-05
2.0	1.448e+08	2.593e-04	3.363e-03	4.010e-07	5.200e-06
3.0	1.874e+07	3.376e-04	2.577e-03	4.581e-07	3.496e-06
TOTALS:	1.485e+14	1.125e-03	3.422e-02	1.795e-06	6.154e-05

Results - Dose Point # 2 - (4099.56,430.53,0) cm

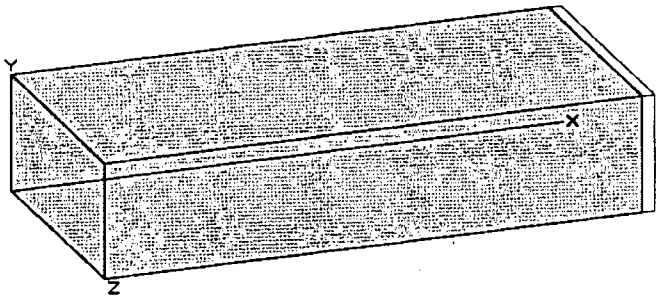
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.038e+04	0.000e+00	8.984e-32	0.000e+00	7.705e-33
0.02	8.991e+06	0.000e+00	2.208e-28	0.000e+00	7.650e-30
0.03	8.202e+13	1.923e-104	3.819e-20	1.905e-106	3.785e-22
0.04	3.929e+07	9.862e-57	1.615e-25	4.362e-59	7.142e-28
0.05	5.312e+06	2.556e-38	1.982e-25	6.810e-41	5.281e-28
0.06	2.745e+07	5.617e-29	5.140e-24	1.116e-31	1.021e-26
0.08	6.271e+13	2.071e-15	3.207e-11	3.278e-18	5.075e-14
0.1	4.886e+06	1.449e-19	1.915e-15	2.218e-22	2.929e-18
0.15	8.648e+07	3.265e-15	2.287e-11	5.377e-18	3.766e-14
0.2	1.311e+11	1.771e-10	5.841e-07	3.126e-13	1.031e-09
0.3	2.366e+11	2.493e-08	2.510e-05	4.728e-11	4.761e-08
0.4	2.934e+12	5.400e-06	2.329e-03	1.052e-08	4.538e-06
0.5	7.336e+10	1.125e-06	2.617e-04	2.208e-09	5.137e-07
0.6	2.795e+11	2.265e-05	3.277e-03	4.422e-08	6.396e-06
0.8	7.145e+10	7.159e-05	5.207e-03	1.362e-07	9.905e-06
1.0	1.581e+09	1.008e-05	4.501e-04	1.859e-08	8.298e-07
1.5	1.220e+09	1.731e-04	3.585e-03	2.912e-07	6.032e-06
2.0	1.448e+08	1.419e-04	1.853e-03	2.195e-07	2.865e-06
3.0	1.874e+07	1.872e-04	1.438e-03	2.539e-07	1.951e-06
TOTALS:	1.485e+14	6.130e-04	1.843e-02	9.763e-07	3.308e-05

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

Page : 1
DOS File: S13RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:51:43 AM
Duration: 00:00:21

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

Case Title: Case 13 RB-CR
Description: REACTOR BUILDING TO CONTROL RM -SOURCE BF- 720.0 HR
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	4.0e+3 cm	131 ft 0.0 in
Width	1.9e+3 cm	62 ft 12.0 in
Height	861.06 cm	28 ft 3.0 in

Dose Points

	X	Y	Z
# 1	4099.56 cm	430.53 cm	960.2 cm
	134 ft 6.0 in	14 ft 1.5 in	31 ft 6.0 in
# 2	4099.56 cm	430.53 cm	0 cm
	134 ft 6.0 in	14 ft 1.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.60e+09 cm³	Air	0.00122
Shield 1	91.44 cm	Mixed ->	2.35122
		Air	0.00122
		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/cm³	Bq/cm³
Am-241	4.3963e-008	1.6266e+003	6.6590e-012	2.4638e-007
Ba-137m	2.8305e-002	1.0473e+009	4.2873e-006	1.5863e-001
Ba-139				
Ba-140	5.3127e-003	1.9657e+008	8.0470e-007	2.9774e-002
Ce-141	3.2964e-004	1.2197e+007	4.9930e-008	1.8474e-003
Ce-143	1.5653e-009	5.7918e+001	2.3710e-013	8.7727e-009
Ce-144	4.8723e-004	1.8028e+007	7.3800e-008	2.7306e-003
Cm-242	8.1205e-006	3.0046e+005	1.2300e-009	4.5510e-005
Cm-244	5.3899e-007	1.9943e+004	8.1640e-011	3.0207e-006
Co-58	7.6584e-006	2.8336e+005	1.1600e-009	4.2920e-005
Co-60	5.4691e-006	2.0236e+005	8.2840e-010	3.0651e-005
Cs-134	3.8747e-002	1.4337e+009	5.8690e-006	2.1715e-001
Cs-136	2.6005e-003	9.6220e+007	3.9390e-007	1.4574e-002
Cs-137	2.9921e-002	1.1071e+009	4.5320e-006	1.6768e-001
I-131	3.6972e+001	1.3679e+012	5.6000e-003	2.0720e+002
I-132	1.0260e-002	3.7961e+008	1.5540e-006	5.7498e-002
I-133	3.8721e-008	1.4327e+003	5.8650e-012	2.1700e-007
I-134				
I-135				
Kr-85	3.4806e+002	1.2878e+013	5.2720e-002	1.9506e+003
Kr-85m				

DOS File: S13RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:51:43 AM
Duration: 00:00:21

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Kr-87				
Kr-88				
La-140	6.1716e-003	2.2835e+008	9.3480e-007	3.4588e-002
La-141				
La-142				
Mo-99	1.8208e-006	6.7371e+004	2.7580e-010	1.0205e-005
Nb-95	2.4619e-004	9.1091e+006	3.7290e-008	1.3797e-003
Nd-147	1.5145e-005	5.6037e+005	2.2940e-009	8.4878e-005
Np-239	1.0755e-006	3.9793e+004	1.6290e-010	6.0273e-006
Pr-143	6.2059e-005	2.2962e+006	9.4000e-009	3.4780e-004
Pr-144	4.8026e-004	1.7770e+007	7.2745e-008	2.6916e-003
Pu-238	1.5845e-006	5.8626e+004	2.4000e-010	8.8800e-006
Pu-239	1.6974e-007	6.2803e+003	2.5710e-011	9.5127e-007
Pu-240	2.6983e-007	9.9836e+003	4.0870e-011	1.5122e-006
Pu-241	6.6285e-005	2.4525e+006	1.0040e-008	3.7148e-004
Rb-86	1.2333e-004	4.5631e+006	1.8680e-008	6.9116e-004
Rh-103m	1.7528e-003	6.4855e+007	2.6550e-007	9.8235e-003
Rh-105	1.6466e-009	6.0922e+001	2.4940e-013	9.2278e-009
Rh-106	1.1230e-003	4.1551e+007	1.7010e-007	6.2937e-003
Ru-103	1.7575e-003	6.5026e+007	2.6620e-007	9.8494e-003
Ru-105				
Ru-106	1.1230e-003	4.1551e+007	1.7010e-007	6.2937e-003
Sb-127	1.4696e-005	5.4376e+005	2.2260e-009	8.2362e-005
Sb-129				
Sr-89	9.4475e-003	3.4956e+008	1.4310e-006	5.2947e-002
Sr-90	1.8136e-003	6.7103e+007	2.7470e-007	1.0164e-002
Sr-91				
Sr-92				
Tc-99m	1.8671e-005	6.9081e+005	2.8280e-009	1.0464e-004
Te-127	4.9634e-004	1.8365e+007	7.5180e-008	2.7817e-003
Te-127m	4.7277e-004	1.7493e+007	7.1610e-008	2.6496e-003
Te-129	1.0808e-003	3.9988e+007	1.6370e-007	6.0569e-003
Te-129m	1.2498e-003	4.6241e+007	1.8930e-007	7.0041e-003
Te-131m	4.4412e-010	1.6432e+001	6.7270e-014	2.4890e-009
Te-132	9.0316e-005	3.3417e+006	1.3680e-008	5.0616e-004
Xe-133	1.1263e+003	4.1673e+013	1.7060e-001	6.3122e+003
Xe-135				
Y-90	1.8235e-003	6.7469e+007	2.7620e-007	1.0219e-002
Y-91	1.6360e-004	6.0532e+006	2.4780e-008	9.1686e-004
Y-92				
Y-93				
Zr-95	1.9232e-004	7.1158e+006	2.9130e-008	1.0778e-003
Zr-97				

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results - Dose Point # 1 - (4099.56,430.53,960.2) cm

DOS File: S13RBCR.MS5
Run Date: June 25, 2008
Run Time: 9:51:43 AM
Duration: 00:00:21

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	7.452e+03	0.000e+00	9.905e-32	0.000e+00	8.496e-33
0.02	5.607e+06	0.000e+00	2.115e-28	0.000e+00	7.325e-30
0.03	2.005e+13	9.460e-105	1.434e-20	9.375e-107	1.421e-22
0.04	2.527e+07	1.278e-56	1.595e-25	5.651e-59	7.054e-28
0.05	6.810e+05	6.569e-39	3.902e-26	1.750e-41	1.040e-28
0.06	1.209e+07	4.932e-29	3.494e-24	9.796e-32	6.939e-27
0.08	1.533e+13	1.001e-15	1.546e-11	1.584e-18	2.446e-14
0.1	1.352e+06	7.888e-20	1.039e-15	1.207e-22	1.589e-18
0.15	3.681e+07	2.712e-15	1.889e-11	4.465e-18	3.111e-14
0.2	3.330e+10	8.735e-11	2.864e-07	1.542e-13	5.054e-10
0.3	8.950e+10	1.817e-08	1.818e-05	3.446e-11	3.448e-08
0.4	1.110e+12	3.912e-06	1.677e-03	7.622e-09	3.267e-06
0.5	6.116e+10	1.786e-06	4.129e-04	3.506e-09	8.105e-07
0.6	1.055e+11	1.621e-05	2.330e-03	3.164e-08	4.547e-06
0.8	2.656e+10	5.004e-05	3.617e-03	9.519e-08	6.879e-06
1.0	2.737e+08	3.261e-06	1.446e-04	6.011e-09	2.665e-07
1.5	3.207e+08	8.392e-05	1.727e-03	1.412e-07	2.905e-06
2.0	1.456e+07	2.606e-05	3.380e-04	4.030e-08	5.226e-07
3.0	8.131e+06	1.465e-04	1.118e-03	1.988e-07	1.517e-06
TOTALS:	3.681e+13	3.317e-04	1.138e-02	5.243e-07	2.075e-05

Results - Dose Point # 2 - (4099.56,430.53,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	7.452e+03	0.000e+00	6.451e-32	0.000e+00	5.533e-33
0.02	5.607e+06	0.000e+00	1.377e-28	0.000e+00	4.770e-30
0.03	2.005e+13	4.701e-105	9.337e-21	4.659e-107	9.254e-23
0.04	2.527e+07	6.343e-57	1.039e-25	2.805e-59	4.594e-28
0.05	6.810e+05	3.278e-39	2.542e-26	8.731e-42	6.770e-29
0.06	1.209e+07	2.474e-29	2.264e-24	4.914e-32	4.497e-27
0.08	1.533e+13	5.063e-16	7.839e-12	8.012e-19	1.241e-14
0.1	1.352e+06	4.011e-20	5.298e-16	6.137e-23	8.106e-19
0.15	3.681e+07	1.390e-15	9.734e-12	2.289e-18	1.603e-14
0.2	3.330e+10	4.500e-11	1.484e-07	7.942e-14	2.619e-10
0.3	8.950e+10	9.430e-09	9.495e-06	1.789e-11	1.801e-08
0.4	1.110e+12	2.043e-06	8.812e-04	3.981e-09	1.717e-06
0.5	6.116e+10	9.377e-07	2.182e-04	1.841e-09	4.283e-07
0.6	1.055e+11	8.551e-06	1.237e-03	1.669e-08	2.414e-06
0.8	2.656e+10	2.661e-05	1.935e-03	5.061e-08	3.681e-06
1.0	2.737e+08	1.745e-06	7.790e-05	3.217e-09	1.436e-07
1.5	3.207e+08	4.550e-05	9.425e-04	7.655e-08	1.586e-06
2.0	1.456e+07	1.426e-05	1.862e-04	2.206e-08	2.880e-07
3.0	8.131e+06	8.123e-05	6.241e-04	1.102e-07	8.468e-07
TOTALS:	3.681e+13	1.809e-04	6.112e-03	2.852e-07	1.112e-05

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.	PROJECT	Calc. No. EC-RADN-1129
Date 07/07/2008	DBA-LOCA Total Control Room Dose	
Designed By T.F. Mackay		Sh. No. 176
Checked By R.A.Vazquies		

ATTACHMENT 5
MICROSHIELD COMPUTER CODE OUTPUT
TURBINE BUILDING SHINE

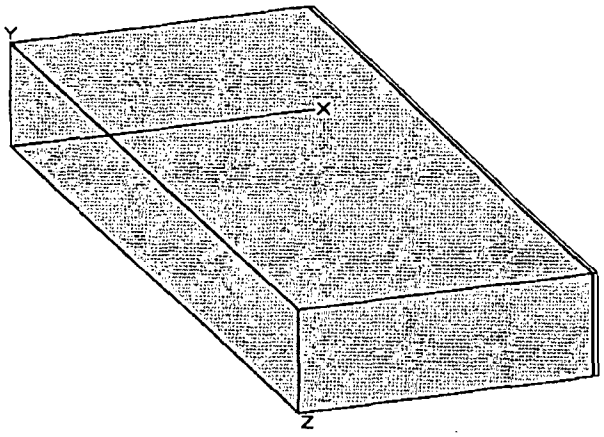
All Attachment 5 pages revised.

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

Page : 1
DOS File: 2TB01667.MS5
Run Date: June 26, 2008
Run Time: 9:24:32 AM
Duration: 00:00:09

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

Case Title: TB Dose
Description: 2.5' Shield - 0.1667 Hours
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Ba-137m	2.0283e-001	7.5049e+009	1.7908e-006	6.6259e-002
Cs-134	2.8486e-001	1.0540e+010	2.5150e-006	9.3055e-002
Cs-136	9.0908e-002	3.3636e+009	8.0260e-007	2.9696e-002
Cs-137	2.1441e-001	7.9333e+009	1.8930e-006	7.0041e-002
I-131	1.3275e+000	4.9117e+010	1.1720e-005	4.3364e-001
I-132	1.8632e+000	6.8940e+010	1.6450e-005	6.0865e-001
I-133	2.7467e+000	1.0163e+011	2.4250e-005	8.9725e-001
I-134	2.6708e+000	9.8820e+010	2.3580e-005	8.7246e-001
I-135	2.5757e+000	9.5300e+010	2.2740e-005	8.4138e-001
Kr-85	4.3370e-002	1.6047e+009	3.8290e-007	1.4167e-002
Kr-85m	7.6591e-001	2.8339e+010	6.7620e-006	2.5019e-001
Kr-87	1.4351e+000	5.3098e+010	1.2670e-005	4.6879e-001
Kr-88	2.0988e+000	7.7657e+010	1.8530e-005	6.8561e-001
Rb-86	2.6878e-003	9.9449e+007	2.3730e-008	8.7801e-004
Xe-133	6.2127e+000	2.2987e+011	5.4850e-005	2.0294e+000
Xe-135	2.0626e+000	7.6315e+010	1.8210e-005	6.7377e-001

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

DOS File: 2TB01667.MS5
Run Date: June 26, 2008
Run Time: 9:24:32 AM
Duration: 00:00:09

Results

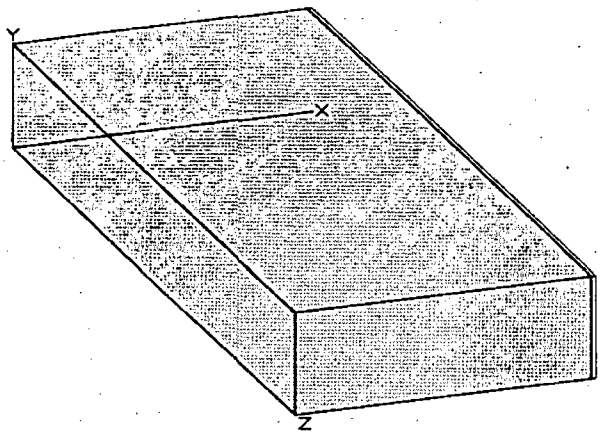
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.217e+11	2.182e-90	1.592e-23	2.162e-92	1.578e-25
0.04	2.312e+08	6.092e-48	2.670e-25	2.694e-50	1.181e-27
0.06	4.192e+08	2.692e-24	1.776e-20	5.348e-27	3.527e-23
0.08	8.586e+10	6.415e-16	5.571e-12	1.015e-18	8.816e-15
0.1	1.669e+08	3.915e-16	3.041e-12	5.989e-19	4.652e-15
0.15	2.939e+10	3.019e-11	1.206e-07	4.972e-14	1.986e-10
0.2	9.463e+10	2.079e-09	4.104e-06	3.670e-12	7.243e-09
0.3	1.580e+10	1.467e-08	9.536e-06	2.782e-11	1.809e-08
0.4	8.848e+10	9.654e-07	2.847e-04	1.881e-09	5.548e-07
0.5	1.277e+11	8.679e-06	1.439e-03	1.704e-08	2.825e-06
0.6	1.502e+11	4.308e-05	4.559e-03	8.408e-08	8.898e-06
0.8	2.842e+11	7.189e-04	3.991e-02	1.367e-06	7.591e-05
1.0	1.106e+11	1.395e-03	4.888e-02	2.571e-06	9.009e-05
1.5	9.421e+10	1.769e-02	3.009e-01	2.976e-05	5.062e-04
2.0	6.961e+10	7.097e-02	7.819e-01	1.097e-04	1.209e-03
3.0	8.024e+09	6.332e-02	4.225e-01	8.591e-05	5.732e-04
TOTALS:	1.281e+12	1.541e-01	1.600e+00	2.295e-04	2.467e-03

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

Page : 1
DOS File: 2TB0-5.MS5
Run Date: June 26, 2008
Run Time: 9:24:23 AM
Duration: 00:00:09

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

Case Title: TB Dose
Description: 2.5' Shield - 0.5 Hours
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Ba-137m	1.6833e+000	6.2283e+010	1.4862e-005	5.4988e-001
Cs-134	2.3639e+000	8.7463e+010	2.0870e-005	7.7219e-001
Cs-136	7.5390e-001	2.7894e+010	6.6560e-006	2.4627e-001
Cs-137	1.7794e+000	6.5838e+010	1.5710e-005	5.8127e-001
I-131	1.1054e+001	4.0899e+011	9.7590e-005	3.6108e+000
I-132	1.4532e+001	5.3769e+011	1.2830e-004	4.7471e+000
I-133	2.2642e+001	8.3775e+011	1.9990e-004	7.3963e+000
I-134	1.7103e+001	6.3282e+011	1.5100e-004	5.5870e+000
I-135	2.0739e+001	7.6735e+011	1.8310e-004	6.7747e+000
Kr-85	4.3664e-001	1.6156e+010	3.8550e-006	1.4264e-001
Kr-85m	7.3238e+000	2.7098e+011	6.4660e-005	2.3924e+000
Kr-87	1.2052e+001	4.4591e+011	1.0640e-004	3.9368e+000
Kr-88	1.9482e+001	7.2083e+011	1.7200e-004	6.3640e+000
Rb-86	2.2291e-002	8.2476e+008	1.9680e-007	7.2816e-003
Xe-133	6.2500e+001	2.3125e+012	5.5180e-004	2.0417e+001
Xe-135	2.0818e+001	7.7028e+011	1.8380e-004	6.8006e+000

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

For Information Only
DOS File: 2TB0-5.MS5
Run Date: June 26, 2008
Run Time: 9:24:23 AM
Duration: 00:00:09

Results

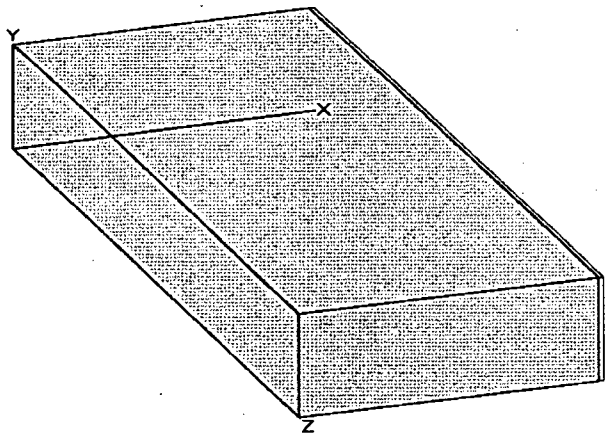
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.210e+12	2.168e-89	1.583e-22	2.149e-91	1.568e-24
0.04	1.918e+09	5.054e-47	2.215e-24	2.235e-49	9.795e-27
0.06	3.476e+09	2.233e-23	1.473e-19	4.435e-26	2.925e-22
0.08	8.611e+11	6.434e-15	5.588e-11	1.018e-17	8.842e-14
0.1	1.536e+09	3.602e-15	2.798e-11	5.510e-18	4.281e-14
0.15	2.646e+11	2.719e-10	1.086e-06	4.477e-13	1.789e-09
0.2	9.227e+11	2.027e-08	4.002e-05	3.578e-11	7.063e-08
0.3	1.334e+11	1.239e-07	8.055e-05	2.350e-10	1.528e-07
0.4	7.154e+11	7.806e-06	2.302e-03	1.521e-08	4.486e-06
0.5	1.020e+12	6.937e-05	1.150e-02	1.362e-07	2.258e-05
0.6	1.144e+12	3.279e-04	3.470e-02	6.401e-07	6.774e-05
0.8	2.006e+12	5.073e-03	2.817e-01	9.650e-06	5.357e-04
1.0	8.321e+11	1.049e-02	3.676e-01	1.933e-05	6.775e-04
1.5	7.520e+11	1.412e-01	2.402e+00	2.376e-04	4.041e-03
2.0	6.056e+11	6.174e-01	6.802e+00	9.547e-04	1.052e-02
3.0	6.792e+10	5.360e-01	3.576e+00	7.271e-04	4.851e-03
TOTALS:	1.054e+13	1.311e+00	1.348e+01	1.949e-03	2.072e-02

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

Page : 1
DOS File: 2TB1.MS5
Run Date: June 26, 2008
Run Time: 9:24:42 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 2.5' Shield - 1 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	3.6551e-006	1.3524e+005	3.2270e-011	1.1940e-006
Ba-137m	6.8533e+000	2.5357e+011	6.0506e-005	2.2387e+000
Ba-139	1.6979e+000	6.2821e+010	1.4990e-005	5.5463e-001
Ba-140	2.8124e+000	1.0406e+011	2.4830e-005	9.1871e-001
Ce-141	6.4664e-002	2.3926e+009	5.7090e-007	2.1123e-002
Ce-143	5.8785e-002	2.1751e+009	5.1900e-007	1.9203e-002
Ce-144	5.4379e-002	2.0120e+009	4.8010e-007	1.7764e-002
Cm-242	9.5699e-004	3.5409e+007	8.4490e-009	3.1261e-004
Cm-244	5.6089e-005	2.0753e+006	4.9520e-010	1.8322e-005
Co-58	1.0655e-003	3.9423e+007	9.4070e-009	3.4806e-004
Co-60	5.7358e-004	2.1222e+007	5.0640e-009	1.8737e-004
Cs-134	9.6254e+000	3.5614e+011	8.4980e-005	3.1443e+000
Cs-136	3.0673e+000	1.1349e+011	2.7080e-005	1.0020e+000
Cs-137	7.2445e+000	2.6805e+011	6.3960e-005	2.3665e+000
I-131	4.8954e+001	1.8113e+012	4.3220e-004	1.5991e+001
I-132	6.0122e+001	2.2245e+012	5.3080e-004	1.9640e+001
I-133	9.8780e+001	3.6548e+012	8.7210e-004	3.2268e+001
I-134	5.1106e+001	1.8909e+012	4.5120e-004	1.6694e+001
I-135	8.7283e+001	3.2295e+012	7.7060e-004	2.8512e+001
Kr-85	2.8702e+000	1.0620e+011	2.5340e-005	9.3758e-001
Kr-85m	4.4548e+001	1.6483e+012	3.9330e-004	1.4552e+001
Kr-87	6.0303e+001	2.2312e+012	5.3240e-004	1.9699e+001
Kr-88	1.1338e+002	4.1950e+012	1.0010e-003	3.7037e+001
La-140	4.8036e-002	1.7773e+009	4.2410e-007	1.5692e-002
La-141	2.1441e-002	7.9333e+008	1.8930e-007	7.0041e-003

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	1.5982e-002	5.9133e+008	1.4110e-007	5.2207e-003
Mo-99	3.5951e-001	1.3302e+010	3.1740e-006	1.1744e-001
Nb-95	2.7614e-002	1.0217e+009	2.4380e-007	9.0206e-003
Nd-147	1.0414e-002	3.8531e+008	9.1940e-008	3.4018e-003
Np-239	7.5356e-001	2.7882e+010	6.6530e-006	2.4616e-001
Pr-143	2.3174e-002	8.5745e+008	2.0460e-007	7.5702e-003
Pr-144	5.3602e-002	1.9833e+009	4.7323e-007	1.7510e-002
Pu-238	1.6390e-004	6.0642e+006	1.4470e-009	5.3539e-005
Pu-239	1.7409e-005	6.4413e+005	1.5370e-010	5.6869e-006
Pu-240	2.7988e-005	1.0356e+006	2.4710e-010	9.1427e-006
Pu-241	6.9024e-003	2.5539e+008	6.0940e-008	2.2548e-003
Rb-86	9.0738e-002	3.3573e+009	8.0110e-007	2.9641e-002
Rh-103m	3.0863e-001	1.1419e+010	2.7248e-006	1.0082e-001
Rh-105	1.9935e-001	7.3759e+009	1.7600e-006	6.5120e-002
Rh-106	1.2323e-001	4.5596e+009	1.0880e-006	4.0256e-002
Ru-103	3.0944e-001	1.1449e+010	2.7320e-006	1.0108e-001
Ru-105	1.8304e-001	6.7724e+009	1.6160e-006	5.9792e-002
Ru-106	1.2323e-001	4.5596e+009	1.0880e-006	4.0256e-002
Sb-127	3.3538e-001	1.2409e+010	2.9610e-006	1.0956e-001
Sb-129	1.0635e+000	3.9348e+010	9.3890e-006	3.4739e-001
Sr-89	1.4781e+000	5.4691e+010	1.3050e-005	4.8285e-001
Sr-90	1.8848e-001	6.9736e+009	1.6640e-006	6.1568e-002
Sr-91	1.7522e+000	6.4832e+010	1.5470e-005	5.7239e-001
Sr-92	1.5495e+000	5.7331e+010	1.3680e-005	5.0616e-001
Tc-99m	3.2168e-001	1.1902e+010	2.8400e-006	1.0508e-001
Te-127	3.3482e-001	1.2388e+010	2.9560e-006	1.0937e-001
Te-127m	5.7143e-002	2.1143e+009	5.0450e-007	1.8667e-002
Te-129	1.1309e+000	4.1841e+010	9.9840e-006	3.6941e-001
Te-129m	2.3933e-001	8.8553e+009	2.1130e-006	7.8181e-002
Te-131m	7.5526e-001	2.7945e+010	6.6680e-006	2.4672e-001
Te-132	5.4911e+000	2.0317e+011	4.8480e-005	1.7938e+000
Xe-133	4.1025e+002	1.5179e+013	3.6220e-003	1.3401e+002
Xe-135	1.3818e+002	5.1128e+012	1.2200e-003	4.5140e+001
Y-90	2.7139e-003	1.0041e+008	2.3960e-008	8.8652e-004
Y-91	1.9391e-002	7.1747e+008	1.7120e-007	6.3344e-003
Y-92	1.3547e-001	5.0123e+009	1.1960e-006	4.4252e-002
Y-93	1.4351e-002	5.3098e+008	1.2670e-007	4.6879e-003
Zr-95	2.7603e-002	1.0213e+009	2.4370e-007	9.0169e-003
Zr-97	2.6221e-002	9.7018e+008	2.3150e-007	8.5655e-003

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.329e+06	0.000e+00	3.231e-30	0.000e+00	2.772e-31

DOS File: 2TB1.MS5
Run Date: June 26, 2008
Run Time: 9:24:42 AM
Duration: 00:00:12

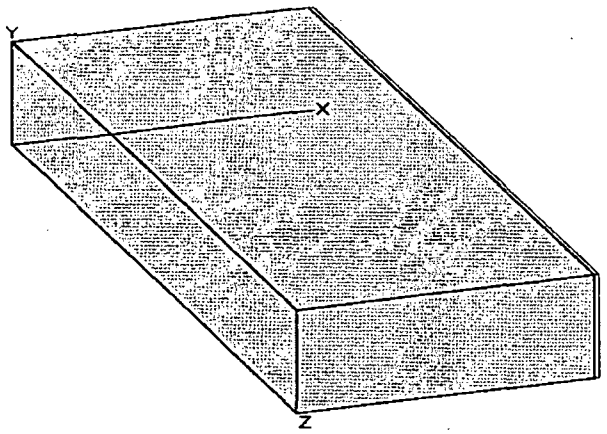
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.334e+09	1.850e-277	1.611e-26	6.408e-279	5.579e-28
0.03	7.981e+12	1.430e-88	1.044e-21	1.418e-90	1.035e-23
0.04	1.083e+10	2.854e-46	1.250e-23	1.262e-48	5.531e-26
0.05	2.671e+10	9.874e-30	2.800e-22	2.630e-32	7.460e-25
0.06	1.490e+10	9.567e-23	6.310e-19	1.900e-25	1.253e-21
0.08	5.627e+12	4.204e-14	3.651e-10	6.653e-17	5.777e-13
0.1	3.917e+10	9.186e-14	7.136e-10	1.405e-16	1.092e-12
0.15	1.534e+12	1.576e-09	6.295e-06	2.595e-12	1.037e-08
0.2	6.043e+12	1.328e-07	2.621e-04	2.344e-10	4.626e-07
0.3	6.561e+11	6.091e-07	3.961e-04	1.155e-09	7.513e-07
0.4	3.220e+12	3.513e-05	1.036e-02	6.845e-08	2.019e-05
0.5	4.363e+12	2.967e-04	4.919e-02	5.823e-07	9.655e-05
0.6	4.583e+12	1.314e-03	1.391e-01	2.565e-06	2.714e-04
0.8	7.316e+12	1.850e-02	1.027e+00	3.520e-05	1.954e-03
1.0	3.344e+12	4.215e-02	1.477e+00	7.770e-05	2.723e-03
1.5	3.339e+12	6.269e-01	1.066e+01	1.055e-03	1.794e-02
2.0	3.205e+12	3.268e+00	3.600e+01	5.053e-03	5.567e-02
3.0	3.446e+11	2.719e+00	1.814e+01	3.689e-03	2.462e-02
4.0	1.552e+07	4.154e-04	2.058e-03	5.139e-07	2.546e-06
TOTALS:	5.165e+13	6.677e+00	6.751e+01	9.914e-03	1.033e-01

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

Page : 1
DOS File: 2TB2.MS5
Run Date: June 26, 2008
Run Time: 9:25:06 AM
Duration: 00:00:11

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

Case Title: TB Dose
Description: 2.5' Shield - 2 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	2.9630e-005	1.0963e+006	2.6160e-010	9.6792e-006
Ba-137m	2.7848e+001	1.0304e+012	2.4587e-004	9.0970e+000
Ba-139	8.3228e+000	3.0794e+011	7.3480e-005	2.7188e+000
Ba-140	2.2744e+001	8.4152e+011	2.0080e-004	7.4296e+000
Ce-141	5.2386e-001	1.9383e+010	4.6250e-006	1.7113e-001
Ce-143	4.6654e-001	1.7262e+010	4.1190e-006	1.5240e-001
Ce-144	4.4072e-001	1.6307e+010	3.8910e-006	1.4397e-001
Cm-242	7.7542e-003	2.8691e+008	6.8460e-008	2.5330e-003
Cm-244	4.5465e-004	1.6822e+007	4.0140e-009	1.4852e-004
Co-58	8.6320e-003	3.1938e+008	7.6210e-008	2.8198e-003
Co-60	4.6484e-003	1.7199e+008	4.1040e-008	1.5185e-003
Cs-134	3.9100e+001	1.4467e+012	3.4520e-004	1.2772e+001
Cs-136	1.2437e+001	4.6016e+011	1.0980e-004	4.0626e+000
Cs-137	2.9438e+001	1.0892e+012	2.5990e-004	9.6163e+000
I-131	2.1475e+002	7.9459e+012	1.8960e-003	7.0152e+001
I-132	2.3231e+002	8.5954e+012	2.0510e-003	7.5887e+001
I-133	4.2067e+002	1.5565e+013	3.7140e-003	1.3742e+002
I-134	1.0205e+002	3.7760e+012	9.0100e-004	3.3337e+001
I-135	3.4603e+002	1.2803e+013	3.0550e-003	1.1304e+002
Kr-85	1.7194e+001	6.3617e+011	1.5180e-004	5.6166e+000
Kr-85m	2.2868e+002	8.4613e+012	2.0190e-003	7.4703e+001
Kr-87	2.0943e+002	7.7489e+012	1.8490e-003	6.8413e+001
Kr-88	5.3201e+002	1.9684e+013	4.6970e-003	1.7379e+002
La-140	6.3667e-001	2.3557e+010	5.6210e-006	2.0798e-001
La-141	1.4566e-001	5.3894e+009	1.2860e-006	4.7582e-002

Nuclide	curies	becquerels	uCi/cm³	Bq/cm³
La-142	8.2639e-002	3.0576e+009	7.2960e-007	2.6995e-002
Mo-99	2.8826e+000	1.0666e+011	2.5450e-005	9.4165e-001
Nb-95	2.2381e-001	8.2811e+009	1.9760e-006	7.3112e-002
Nd-147	8.4180e-002	3.1146e+009	7.4320e-007	2.7498e-002
Np-239	6.0326e+000	2.2320e+011	5.3260e-005	1.9706e+000
Pr-143	1.8825e-001	6.9652e+009	1.6620e-006	6.1494e-002
Pr-144	4.3442e-001	1.6073e+010	3.8354e-006	1.4191e-001
Pu-238	1.3286e-003	4.9159e+007	1.1730e-008	4.3401e-004
Pu-239	1.4113e-004	5.2218e+006	1.2460e-009	4.6102e-005
Pu-240	2.2687e-004	8.3943e+006	2.0030e-009	7.4111e-005
Pu-241	5.5942e-002	2.0699e+009	4.9390e-007	1.8274e-002
Rb-86	3.6823e-001	1.3624e+010	3.2510e-006	1.2029e-001
Rh-103m	2.4989e+000	9.2458e+010	2.2062e-005	8.1629e-001
Rh-105	1.6106e+000	5.9594e+010	1.4220e-005	5.2614e-001
Rh-106	9.9890e-001	3.6959e+010	8.8190e-006	3.2630e-001
Ru-103	2.5055e+000	9.2702e+010	2.2120e-005	8.1844e-001
Ru-105	1.2686e+000	4.6938e+010	1.1200e-005	4.1440e-001
Ru-106	9.9890e-001	3.6959e+010	8.8190e-006	3.2630e-001
Sb-127	2.6980e+000	9.9826e+010	2.3820e-005	8.8134e-001
Sb-129	7.3419e+000	2.7165e+011	6.4820e-005	2.3983e+000
Sr-89	1.1972e+001	4.4297e+011	1.0570e-004	3.9109e+000
Sr-90	1.5280e+000	5.6535e+010	1.3490e-005	4.9913e-001
Sr-91	1.3207e+001	4.8865e+011	1.1660e-004	4.3142e+000
Sr-92	9.7250e+000	3.5983e+011	8.5860e-005	3.1768e+000
Tc-99m	2.6029e+000	9.6306e+010	2.2980e-005	8.5026e-001
Te-127	2.7116e+000	1.0033e+011	2.3940e-005	8.8578e-001
Te-127m	4.6315e-001	1.7136e+010	4.0890e-006	1.5129e-001
Te-129	8.4463e+000	3.1251e+011	7.4570e-005	2.7591e+000
Te-129m	1.9391e+000	7.1747e+010	1.7120e-005	6.3344e-001
Te-131m	5.9816e+000	2.2132e+011	5.2810e-005	1.9540e+000
Te-132	4.4106e+001	1.6319e+012	3.8940e-004	1.4408e+001
Xe-133	2.4488e+003	9.0606e+013	2.1620e-002	7.9994e+002
Xe-135	8.1892e+002	3.0300e+013	7.2300e-003	2.6751e+002
Y-90	3.2507e-002	1.2028e+009	2.8700e-007	1.0619e-002
Y-91	1.5891e-001	5.8798e+009	1.4030e-006	5.1911e-002
Y-92	2.1690e+000	8.0255e+010	1.9150e-005	7.0855e-001
Y-93	1.0861e-001	4.0186e+009	9.5890e-007	3.5479e-002
Zr-95	2.2359e-001	8.2727e+009	1.9740e-006	7.3038e-002
Zr-97	2.0399e-001	7.5477e+009	1.8010e-006	6.6637e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.051e+07	0.000e+00	2.555e-29	0.000e+00	2.191e-30

For Information Only
DOS File: 2TB2.MS5
Run Date: June 26, 2008
Run Time: 9:25:06 AM
Duration: 00:00:11

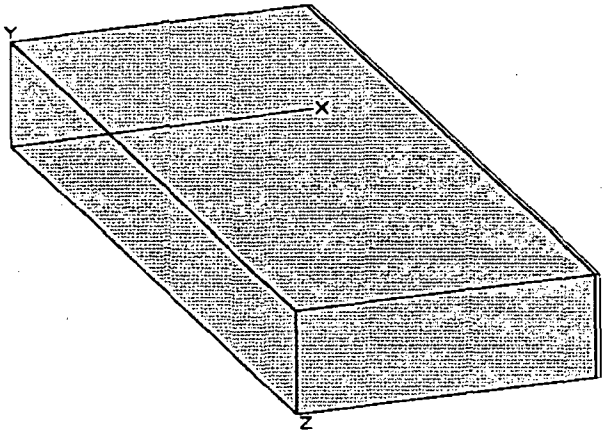
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.882e+10	1.491e-276	1.298e-25	5.165e-278	4.497e-27
0.03	4.746e+13	8.506e-88	6.208e-21	8.430e-90	6.152e-23
0.04	5.469e+10	1.441e-45	6.316e-23	6.375e-48	2.793e-25
0.05	2.145e+11	7.931e-29	2.249e-21	2.113e-31	5.992e-24
0.06	6.336e+10	4.069e-22	2.684e-18	8.083e-25	5.331e-21
0.08	3.350e+13	2.503e-13	2.174e-09	3.961e-16	3.440e-12
0.1	2.842e+11	6.665e-13	5.178e-09	1.020e-15	7.922e-12
0.15	7.583e+12	7.789e-09	3.112e-05	1.283e-11	5.124e-08
0.2	3.447e+13	7.573e-07	1.495e-03	1.337e-09	2.638e-06
0.3	3.000e+12	2.785e-06	1.811e-03	5.283e-09	3.435e-06
0.4	1.257e+13	1.372e-04	4.045e-02	2.672e-07	7.882e-05
0.5	1.796e+13	1.221e-03	2.025e-01	2.397e-06	3.974e-04
0.6	1.715e+13	4.918e-03	5.204e-01	9.599e-06	1.016e-03
0.8	2.301e+13	5.820e-02	3.231e+00	1.107e-04	6.146e-03
1.0	1.222e+13	1.540e-01	5.397e+00	2.839e-04	9.949e-03
1.5	1.338e+13	2.512e+00	4.273e+01	4.227e-03	7.189e-02
2.0	1.423e+13	1.451e+01	1.598e+02	2.243e-02	2.472e-01
3.0	1.237e+12	9.763e+00	6.514e+01	1.325e-02	8.837e-02
4.0	8.026e+07	2.148e-03	1.064e-02	2.657e-06	1.316e-05
TOTALS:	2.384e+14	2.700e+01	2.771e+02	4.032e-02	4.250e-01

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

Page : 1
DOS File: 2TB4.MS5
Run Date: June 26, 2008
Time: 9:25:42 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 2.5' Shield - 4 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	5.9975e-005	2.2191e+006	5.2950e-010	1.9591e-005
Ba-137m	5.0393e+001	1.8645e+012	4.4490e-004	1.6461e+001
Ba-139	6.1572e+000	2.2781e+011	5.4360e-005	2.0113e+000
Ba-140	4.5794e+001	1.6944e+012	4.0430e-004	1.4959e+001
Ce-141	1.0581e+000	3.9151e+010	9.3420e-006	3.4565e-001
Ce-143	9.0488e-001	3.3481e+010	7.9890e-006	2.9559e-001
Ce-144	8.9107e-001	3.2969e+010	7.8670e-006	2.9108e-001
Cm-242	1.5676e-002	5.8001e+008	1.3840e-007	5.1208e-003
Cm-244	9.1950e-004	3.4021e+007	8.1180e-009	3.0037e-004
Co-58	1.7443e-002	6.4539e+008	1.5400e-007	5.6980e-003
Co-60	9.4011e-003	3.4784e+008	8.3000e-008	3.0710e-003
Cs-134	7.0757e+001	2.6180e+012	6.2470e-004	2.3114e+001
Cs-136	2.2393e+001	8.2853e+011	1.9770e-004	7.3149e+000
Cs-137	5.3269e+001	1.9710e+012	4.7030e-004	1.7401e+001
I-131	4.1150e+002	1.5225e+013	3.6330e-003	1.3442e+002
I-132	2.9936e+002	1.1076e+013	2.6430e-003	9.7791e+001
I-133	7.5900e+002	2.8083e+013	6.7010e-003	2.4794e+002
I-134	4.0493e+001	1.4982e+012	3.5750e-004	1.3227e+001
I-135	5.4119e+002	2.0024e+013	4.7780e-003	1.7679e+002
Kr-85	6.8084e+001	2.5191e+012	6.0110e-004	2.2241e+001
Kr-85m	6.6442e+002	2.4584e+013	5.8660e-003	2.1704e+002
Kr-87	2.7886e+002	1.0318e+013	2.4620e-003	9.1094e+001
Kr-88	1.2924e+003	4.7818e+013	1.1410e-002	4.2217e+002
La-140	2.6878e+000	9.9449e+010	2.3730e-005	8.7801e-001
La-141	2.0716e-001	7.6651e+009	1.8290e-006	6.7673e-002

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	6.8005e-002	2.5162e+009	6.0040e-007	2.2215e-002
Mo-99	5.7098e+000	2.1126e+011	5.0410e-005	1.8652e+000
Nb-95	4.5261e-001	1.6747e+010	3.9960e-006	1.4785e-001
Nd-147	1.6933e-001	6.2653e+009	1.4950e-006	5.5315e-002
Np-239	1.1904e+001	4.4046e+011	1.0510e-004	3.8887e+000
Pr-143	3.8284e-001	1.4165e+010	3.3800e-006	1.2506e-001
Pr-144	8.7832e-001	3.2498e+010	7.7545e-006	2.8692e-001
Pu-238	2.6867e-003	9.9407e+007	2.3720e-008	8.7764e-004
Pu-239	2.8543e-004	1.0561e+007	2.5200e-009	9.3240e-005
Pu-240	4.5884e-004	1.6977e+007	4.0510e-009	1.4989e-004
Pu-241	1.1316e-001	4.1871e+009	9.9910e-007	3.6967e-002
Rb-86	6.6555e-001	2.4625e+010	5.8760e-006	2.1741e-001
Rh-103m	5.0474e+000	1.8675e+011	4.4562e-005	1.6488e+000
Rh-105	3.2179e+000	1.1906e+011	2.8410e-005	1.0512e+000
Rh-106	2.0195e+000	7.4723e+010	1.7830e-005	6.5971e-001
Ru-103	5.0607e+000	1.8725e+011	4.4680e-005	1.6532e+000
Ru-105	1.8780e+000	6.9484e+010	1.6580e-005	6.1346e-001
Ru-106	2.0195e+000	7.4723e+010	1.7830e-005	6.5971e-001
Sb-127	5.3756e+000	1.9890e+011	4.7460e-005	1.7560e+000
Sb-129	1.0773e+001	3.9859e+011	9.5110e-005	3.5191e+000
Sr-89	2.4194e+001	8.9517e+011	2.1360e-004	7.9032e+000
Sr-90	3.0899e+000	1.1433e+011	2.7280e-005	1.0094e+000
Sr-91	2.3084e+001	8.5410e+011	2.0380e-004	7.5406e+000
Sr-92	1.1791e+001	4.3627e+011	1.0410e-004	3.8517e+000
Tc-99m	5.2318e+000	1.9358e+011	4.6190e-005	1.7090e+000
Te-127	5.4708e+000	2.0242e+011	4.8300e-005	1.7871e+000
Te-127m	9.3671e-001	3.4658e+010	8.2700e-006	3.0599e-001
Te-129	1.3807e+001	5.1086e+011	1.2190e-004	4.5103e+000
Te-129m	3.9201e+000	1.4505e+011	3.4610e-005	1.2806e+000
Te-131m	1.1553e+001	4.2747e+011	1.0200e-004	3.7740e+000
Te-132	8.7645e+001	3.2429e+012	7.7380e-004	2.8631e+001
Xe-133	9.6050e+003	3.5538e+014	8.4800e-002	3.1376e+003
Xe-135	2.8917e+003	1.0699e+014	2.5530e-002	9.4461e+002
Y-90	1.2584e-001	4.6560e+009	1.1110e-006	4.1107e-002
Y-91	3.3051e-001	1.2229e+010	2.9180e-006	1.0797e-001
Y-92	7.5164e+000	2.7810e+011	6.6360e-005	2.4553e+000
Y-93	1.9153e-001	7.0867e+009	1.6910e-006	6.2567e-002
Zr-95	4.5182e-001	1.6717e+010	3.9890e-006	1.4759e-001
Zr-97	3.8012e-001	1.4065e+010	3.3560e-006	1.2417e-001

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.028e+07	0.000e+00	4.931e-29	0.000e+00	4.230e-30

DOS File: 2TB4.MS5
Run Date: June 26, 2008
Run Time: 9:25:42 AM
Duration: 00:00:12

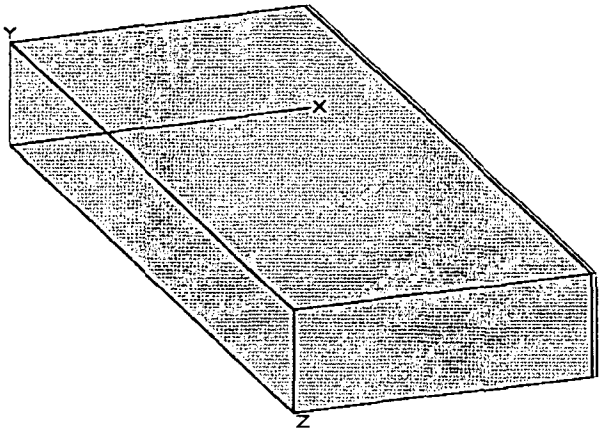
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.765e+10	2.984e-276	2.598e-25	1.034e-277	8.999e-27
0.03	1.807e+14	3.239e-87	2.364e-20	3.210e-89	2.343e-22
0.04	1.004e+11	2.646e-45	1.160e-22	1.170e-47	5.129e-25
0.05	4.263e+11	1.576e-28	4.470e-21	4.198e-31	1.191e-23
0.06	1.151e+11	7.392e-22	4.875e-18	1.468e-24	9.683e-21
0.08	1.309e+14	9.780e-13	8.493e-09	1.548e-15	1.344e-11
0.1	5.779e+11	1.355e-12	1.053e-08	2.074e-15	1.611e-11
0.15	2.097e+13	2.154e-08	8.605e-05	3.547e-11	1.417e-07
0.2	1.126e+14	2.475e-06	4.885e-03	4.368e-09	8.622e-06
0.3	6.579e+12	6.109e-06	3.972e-03	1.159e-08	7.534e-06
0.4	2.133e+13	2.328e-04	6.865e-02	4.535e-07	1.338e-04
0.5	3.059e+13	2.080e-03	3.448e-01	4.082e-06	6.769e-04
0.6	2.512e+13	7.203e-03	7.623e-01	1.406e-05	1.488e-03
0.8	2.922e+13	7.391e-02	4.103e+00	1.406e-04	7.804e-03
1.0	1.831e+13	2.308e-01	8.089e+00	4.255e-04	1.491e-02
1.5	2.292e+13	4.304e+00	7.320e+01	7.241e-03	1.232e-01
2.0	3.212e+13	3.275e+01	3.608e+02	5.064e-02	5.580e-01
3.0	1.816e+12	1.433e+01	9.562e+01	1.944e-02	1.297e-01
4.0	6.605e+07	1.767e-03	8.757e-03	2.187e-06	1.083e-05
TOTALS:	6.345e+14	5.170e+01	5.430e+02	7.791e-02	8.359e-01

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

Page : 1
DOS File: 2TB8.MS5
Run Date: June 26, 2008
Time: 9:26:39 AM
Duration: 00:00:20

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

Case Title: TB Dose
Description: 2.5' Shield - 8 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	6.4720e-005	2.3947e+006	5.7140e-010	2.1142e-005
Ba-137m	5.4057e+001	2.0001e+012	4.7726e-004	1.7659e+001
Ba-139	8.8755e-001	3.2840e+010	7.8360e-006	2.8993e-001
Ba-140	4.8897e+001	1.8092e+012	4.3170e-004	1.5973e+001
Ce-141	1.1372e+000	4.2076e+010	1.0040e-005	3.7148e-001
Ce-143	8.9650e-001	3.3171e+010	7.9150e-006	2.9286e-001
Ce-144	9.5982e-001	3.5513e+010	8.4740e-006	3.1354e-001
Cm-242	1.6888e-002	6.2486e+008	1.4910e-007	5.5167e-003
Cm-244	9.9074e-004	3.6657e+007	8.7470e-009	3.2364e-004
Co-58	1.8768e-002	6.9442e+008	1.6570e-007	6.1309e-003
Co-60	1.0129e-002	3.7479e+008	8.9430e-008	3.3089e-003
Cs-134	7.5900e+001	2.8083e+012	6.7010e-004	2.4794e+001
Cs-136	2.3820e+001	8.8134e+011	2.1030e-004	7.7811e+000
Cs-137	5.7143e+001	2.1143e+012	5.0450e-004	1.8667e+001
I-131	4.9418e+002	1.8285e+013	4.3630e-003	1.6143e+002
I-132	1.7602e+002	6.5126e+012	1.5540e-003	5.7498e+001
I-133	8.0917e+002	2.9939e+013	7.1440e-003	2.6433e+002
I-134	2.0875e+000	7.7237e+010	1.8430e-005	6.8191e-001
I-135	4.3336e+002	1.6034e+013	3.8260e-003	1.4156e+002
Kr-85	2.2653e+002	8.3817e+012	2.0000e-003	7.4000e+001
Kr-85m	1.1904e+003	4.4046e+013	1.0510e-002	3.8887e+002
Kr-87	1.0483e+002	3.8786e+012	9.2550e-004	3.4244e+001
Kr-88	1.6197e+003	5.9929e+013	1.4300e-002	5.2910e+002
La-140	5.9669e+000	2.2077e+011	5.2680e-005	1.9492e+000
La-141	1.1021e-001	4.0777e+009	9.7300e-007	3.6001e-002

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	1.2131e-002	4.4884e+008	1.0710e-007	3.9627e-003
Mo-99	5.9000e+000	2.1830e+011	5.2090e-005	1.9273e+000
Nb-95	4.8772e-001	1.8046e+010	4.3060e-006	1.5932e-001
Nd-147	1.8055e-001	6.6802e+009	1.5940e-006	5.8978e-002
Np-239	1.2210e+001	4.5177e+011	1.0780e-004	3.9886e+000
Pr-143	4.1693e-001	1.5427e+010	3.6810e-006	1.3620e-001
Pr-144	9.4609e-001	3.5005e+010	8.3528e-006	3.0905e-001
Pu-238	2.8951e-003	1.0712e+008	2.5560e-008	9.4572e-004
Pu-239	3.0774e-004	1.1387e+007	2.7170e-009	1.0053e-004
Pu-240	4.9441e-004	1.8293e+007	4.3650e-009	1.6151e-004
Pu-241	1.2187e-001	4.5094e+009	1.0760e-006	3.9812e-002
Rb-86	7.1675e-001	2.6520e+010	6.3280e-006	2.3414e-001
Rh-103m	5.4225e+000	2.0063e+011	4.7874e-005	1.7713e+000
Rh-105	3.3198e+000	1.2283e+011	2.9310e-005	1.0845e+000
Rh-106	2.1758e+000	8.0506e+010	1.9210e-005	7.1077e-001
Ru-103	5.4368e+000	2.0116e+011	4.8000e-005	1.7760e+000
Ru-105	1.0837e+000	4.0098e+010	9.5680e-006	3.5402e-001
Ru-106	2.1758e+000	8.0506e+010	1.9210e-005	7.1077e-001
Sb-127	5.6214e+000	2.0799e+011	4.9630e-005	1.8363e+000
Sb-129	6.1096e+000	2.2605e+011	5.3940e-005	1.9958e+000
Sr-89	2.6006e+001	9.6222e+011	2.2960e-004	8.4952e+000
Sr-90	3.3300e+000	1.2321e+011	2.9400e-005	1.0878e+000
Sr-91	1.8576e+001	6.8730e+011	1.6400e-004	6.0680e+000
Sr-92	4.5680e+000	1.6902e+011	4.0330e-005	1.4922e+000
Tc-99m	5.5217e+000	2.0430e+011	4.8750e-005	1.8037e+000
Te-127	5.8411e+000	2.1612e+011	5.1570e-005	1.9081e+000
Te-127m	1.0093e+000	3.7345e+010	8.9110e-006	3.2971e-001
Te-129	9.4034e+000	3.4792e+011	8.3020e-005	3.0717e+000
Te-129m	4.2169e+000	1.5603e+011	3.7230e-005	1.3775e+000
Te-131m	1.1349e+001	4.1992e+011	1.0020e-004	3.7074e+000
Te-132	9.1157e+001	3.3728e+012	8.0480e-004	2.9778e+001
Xe-133	3.1250e+004	1.1563e+015	2.7590e-001	1.0208e+004
Xe-135	7.0735e+003	2.6172e+014	6.2450e-002	2.3106e+003
Y-90	2.7082e-001	1.0020e+010	2.3910e-006	8.8467e-002
Y-91	3.7321e-001	1.3809e+010	3.2950e-006	1.2192e-001
Y-92	7.7701e+000	2.8749e+011	6.8600e-005	2.5382e+000
Y-93	1.5676e-001	5.8001e+009	1.3840e-006	5.1208e-002
Zr-95	4.8591e-001	1.7979e+010	4.2900e-006	1.5873e-001
Zr-97	3.4761e-001	1.2862e+010	3.0690e-006	1.1355e-001

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

ergy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.015e+07	0.000e+00	4.899e-29	0.000e+00	4.202e-30

DOS File: 2TB8.MS5
Run Date: June 26, 2008
Run Time: 9:26:39 AM
Duration: 00:00:20

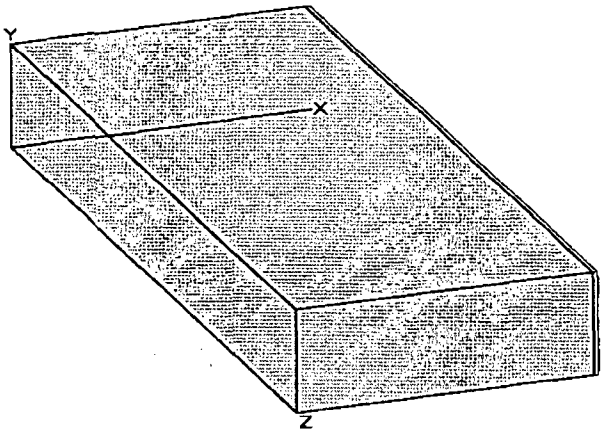
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.969e+10	3.146e-276	2.739e-25	1.090e-277	9.487e-27
0.03	5.732e+14	1.027e-86	7.497e-20	1.018e-88	7.430e-22
0.04	1.047e+11	2.759e-45	1.209e-22	1.220e-47	5.347e-25
0.05	4.434e+11	1.639e-28	4.649e-21	4.367e-31	1.238e-23
0.06	1.219e+11	7.829e-22	5.164e-18	1.555e-24	1.026e-20
0.08	4.249e+14	3.175e-12	2.757e-08	5.024e-15	4.363e-11
0.1	6.143e+11	1.441e-12	1.119e-08	2.204e-15	1.712e-11
0.15	3.641e+13	3.741e-08	1.494e-04	6.160e-11	2.461e-07
0.2	2.555e+14	5.613e-06	1.108e-02	9.907e-09	1.955e-05
0.3	9.329e+12	8.662e-06	5.632e-03	1.643e-08	1.068e-05
0.4	2.140e+13	2.335e-04	6.887e-02	4.550e-07	1.342e-04
0.5	3.083e+13	2.096e-03	3.476e-01	4.115e-06	6.824e-04
0.6	2.405e+13	6.895e-03	7.298e-01	1.346e-05	1.424e-03
0.8	2.363e+13	5.976e-02	3.318e+00	1.137e-04	6.310e-03
1.0	1.560e+13	1.967e-01	6.892e+00	3.625e-04	1.270e-02
1.5	2.160e+13	4.055e+00	6.897e+01	6.822e-03	1.160e-01
2.0	3.857e+13	3.932e+01	4.332e+02	6.081e-02	6.700e-01
3.0	1.013e+12	7.992e+00	5.332e+01	1.084e-02	7.234e-02
4.0	1.178e+07	3.153e-04	1.562e-03	3.900e-07	1.933e-06
TOTALS:	1.477e+15	5.164e+01	5.669e+02	7.897e-02	8.796e-01

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

Page : 1
DOS File: 2TB16.MS5
Run Date: June 26, 2008
Run Time: 9:24:54 AM
Duration: 00:00:11

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

Case Title: TB Dose
Description: 2.5' Shield - 16 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	6.5264e-005	2.4148e+006	5.7620e-010	2.1319e-005
Ba-137m	5.4786e+001	2.0271e+012	4.8369e-004	1.7897e+001
Ba-139	1.5971e-002	5.9091e+008	1.4100e-007	5.2170e-003
Ba-140	4.8297e+001	1.7870e+012	4.2640e-004	1.5777e+001
Ce-141	1.1349e+000	4.1992e+010	1.0020e-005	3.7074e-001
Ce-143	7.6217e-001	2.8200e+010	6.7290e-006	2.4897e-001
Ce-144	9.6458e-001	3.5689e+010	8.5160e-006	3.1509e-001
Cm-242	1.6956e-002	6.2737e+008	1.4970e-007	5.5389e-003
Cm-244	9.9640e-004	3.6867e+007	8.7970e-009	3.2549e-004
Co-58	1.8814e-002	6.9610e+008	1.6610e-007	6.1457e-003
Co-60	1.0187e-002	3.7693e+008	8.9940e-008	3.3278e-003
Cs-134	7.6896e+001	2.8452e+012	6.7890e-004	2.5119e+001
Cs-136	2.3718e+001	8.7756e+011	2.0940e-004	7.7478e+000
Cs-137	5.7913e+001	2.1428e+012	5.1130e-004	1.8918e+001
I-131	6.1277e+002	2.2673e+013	5.4100e-003	2.0017e+002
I-132	1.0724e+002	3.9679e+012	9.4680e-004	3.5032e+001
I-133	7.9071e+002	2.9256e+013	6.9810e-003	2.5830e+002
I-134	4.7674e-003	1.7639e+008	4.2090e-008	1.5573e-003
I-135	2.3888e+002	8.8385e+012	2.1090e-003	7.8033e+001
Kr-85	7.6681e+002	2.8372e+013	6.7700e-003	2.5049e+002
Kr-85m	1.1689e+003	4.3250e+013	1.0320e-002	3.8184e+002
Kr-87	4.5318e+000	1.6768e+011	4.0010e-005	1.4804e+000
Kr-88	7.7848e+002	2.8804e+013	6.8730e-003	2.5430e+002
La-140	1.1519e+001	4.2621e+011	1.0170e-004	3.7629e+000
La-141	2.7037e-002	1.0004e+009	2.3870e-007	8.8319e-003

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	3.3448e-004	1.2376e+007	2.9530e-009	1.0926e-004
Mo-99	5.4549e+000	2.0183e+011	4.8160e-005	1.7819e+000
Nb-95	4.9044e-001	1.8146e+010	4.3300e-006	1.6021e-001
Nd-147	1.7783e-001	6.5796e+009	1.5700e-006	5.8090e-002
Np-239	1.1136e+001	4.1204e+011	9.8320e-005	3.6378e+000
Pr-143	4.2622e-001	1.5770e+010	3.7630e-006	1.3923e-001
Pr-144	9.5078e-001	3.5179e+010	8.3942e-006	3.1059e-001
Pu-238	2.9109e-003	1.0770e+008	2.5700e-008	9.5090e-004
Pu-239	3.0978e-004	1.1462e+007	2.7350e-009	1.0119e-004
Pu-240	4.9724e-004	1.8398e+007	4.3900e-009	1.6243e-004
Pu-241	1.2267e-001	4.5387e+009	1.0830e-006	4.0071e-002
Rb-86	7.4314e-001	2.7496e+010	6.5610e-006	2.4276e-001
Rh-103m	5.4214e+000	2.0059e+011	4.7864e-005	1.7710e+000
Rh-105	2.9427e+000	1.0888e+011	2.5980e-005	9.6126e-001
Rh-106	2.1872e+000	8.0925e+010	1.9310e-005	7.1447e-001
Ru-103	5.4356e+000	2.0112e+011	4.7990e-005	1.7756e+000
Ru-105	3.1261e-001	1.1567e+010	2.7600e-006	1.0212e-001
Ru-106	2.1872e+000	8.0925e+010	1.9310e-005	7.1447e-001
Sb-127	5.3235e+000	1.9697e+011	4.7000e-005	1.7390e+000
Sb-129	1.7024e+000	6.2989e+010	1.5030e-005	5.5611e-001
Sr-89	2.6040e+001	9.6348e+011	2.2990e-004	8.5063e+000
Sr-90	3.3493e+000	1.2392e+011	2.9570e-005	1.0941e+000
Sr-91	1.0422e+001	3.8560e+011	9.2010e-005	3.4044e+000
Sr-92	5.9374e-001	2.1968e+010	5.2420e-006	1.9395e-001
Tc-99m	5.3020e+000	1.9617e+011	4.6810e-005	1.7320e+000
Te-127	5.7449e+000	2.1256e+011	5.0720e-005	1.8766e+000
Te-127m	1.0151e+000	3.7558e+010	8.9620e-006	3.3159e-001
Te-129	5.7754e+000	2.1369e+011	5.0990e-005	1.8866e+000
Te-129m	4.2169e+000	1.5603e+011	3.7230e-005	1.3775e+000
Te-131m	9.4883e+000	3.5107e+011	8.3770e-005	3.0995e+000
Te-132	8.5403e+001	3.1599e+012	7.5400e-004	2.7898e+001
Xe-133	1.0119e+005	3.7441e+015	8.9340e-001	3.3056e+004
Xe-135	1.2856e+004	4.7566e+014	1.1350e-001	4.1995e+003
Y-90	5.2839e-001	1.9550e+010	4.6650e-006	1.7261e-001
Y-91	3.9734e-001	1.4702e+010	3.5080e-006	1.2980e-001
Y-92	2.8747e+000	1.0636e+011	2.5380e-005	9.3906e-001
Y-93	9.1077e-002	3.3699e+009	8.0410e-007	2.9752e-002
Zr-95	4.8693e-001	1.8016e+010	4.2990e-006	1.5906e-001
Zr-97	2.5179e-001	9.3163e+009	2.2230e-006	8.2251e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

ergy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.797e+07	0.000e+00	4.371e-29	0.000e+00	3.749e-30

DOS File: 2TB16.MS5
Run Date: June 26, 2008
Run Time: 9:24:54 AM
Duration: 00:00:11

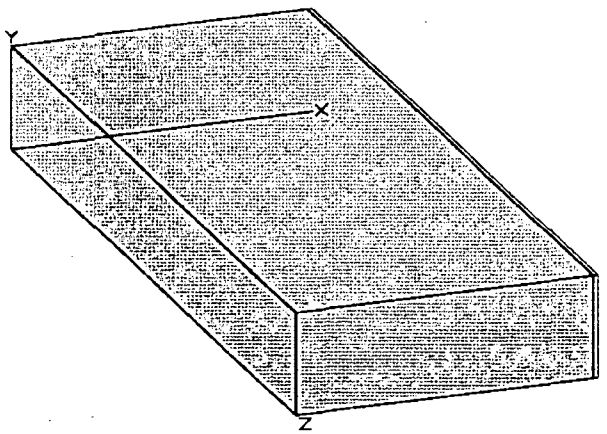
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.836e+10	3.040e-276	2.647e-25	1.053e-277	9.168e-27
0.03	1.825e+15	3.270e-86	2.387e-19	3.241e-88	2.365e-21
0.04	1.021e+11	2.691e-45	1.179e-22	1.190e-47	5.214e-25
0.05	4.155e+11	1.536e-28	4.356e-21	4.092e-31	1.160e-23
0.06	1.202e+11	7.723e-22	5.094e-18	1.534e-24	1.012e-20
0.08	1.375e+15	1.027e-11	8.920e-08	1.625e-14	1.412e-10
0.1	5.103e+11	1.197e-12	9.298e-09	1.831e-15	1.423e-11
0.15	3.543e+13	3.640e-08	1.454e-04	5.994e-11	2.395e-07
0.2	4.411e+14	9.693e-06	1.913e-02	1.711e-08	3.377e-05
0.3	9.100e+12	8.449e-06	5.493e-03	1.603e-08	1.042e-05
0.4	2.296e+13	2.506e-04	7.390e-02	4.882e-07	1.440e-04
0.5	2.898e+13	1.971e-03	3.268e-01	3.868e-06	6.414e-04
0.6	2.752e+13	7.891e-03	8.351e-01	1.540e-05	1.630e-03
0.8	1.559e+13	3.943e-02	2.189e+00	7.499e-05	4.163e-03
1.0	9.104e+12	1.147e-01	4.021e+00	2.115e-04	7.413e-03
1.5	1.171e+13	2.198e+00	3.738e+01	3.698e-03	6.290e-02
2.0	1.864e+13	1.900e+01	2.094e+02	2.939e-02	3.238e-01
3.0	2.609e+11	2.059e+00	1.374e+01	2.793e-03	1.863e-02
4.0	3.249e+05	8.693e-06	4.307e-05	1.075e-08	5.328e-08
TOTALS:	3.821e+15	2.343e+01	2.680e+02	3.619e-02	4.193e-01

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

Page : 1
DOS File: 2TB24.MS5
Run Date: June 26, 2008
Run Time: 9:25:18 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 2.5' Shield - 24 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	6.5445e-005	2.4215e+006	5.7780e-010	2.1379e-005
Ba-137m	5.5225e+001	2.0433e+012	4.8757e-004	1.8040e+001
Ba-139	2.8588e-004	1.0578e+007	2.5240e-009	9.3388e-005
Ba-140	4.7436e+001	1.7551e+012	4.1880e-004	1.5496e+001
Ce-141	1.1276e+000	4.1720e+010	9.9550e-006	3.6833e-001
Ce-143	6.4426e-001	2.3838e+010	5.6880e-006	2.1046e-001
Ce-144	9.6378e-001	3.5660e+010	8.5090e-006	3.1483e-001
Cm-242	1.6933e-002	6.2653e+008	1.4950e-007	5.5315e-003
Cm-244	9.9640e-004	3.6867e+007	8.7970e-009	3.2549e-004
Co-58	1.8757e-002	6.9401e+008	1.6560e-007	6.1272e-003
Co-60	1.0186e-002	3.7688e+008	8.9930e-008	3.3274e-003
Cs-134	7.7497e+001	2.8674e+012	6.8420e-004	2.5315e+001
Cs-136	2.3491e+001	8.6918e+011	2.0740e-004	7.6738e+000
Cs-137	5.8377e+001	2.1600e+012	5.1540e-004	1.9070e+001
I-131	7.3193e+002	2.7081e+013	6.4620e-003	2.3909e+002
I-132	9.5733e+001	3.5421e+012	8.4520e-004	3.1272e+001
I-133	7.4439e+002	2.7542e+013	6.5720e-003	2.4316e+002
I-134	1.0490e-005	3.8811e+005	9.2610e-011	3.4266e-006
I-135	1.2686e+002	4.6938e+012	1.1200e-003	4.1440e+001
Kr-85	1.5959e+003	5.9049e+013	1.4090e-002	5.2133e+002
Kr-85m	7.0565e+002	2.6109e+013	6.2300e-003	2.3051e+002
Kr-87	1.2052e-001	4.4591e+009	1.0640e-006	3.9368e-002
Kr-88	2.2993e+002	8.5074e+012	2.0300e-003	7.5110e+001
La-140	1.6254e+001	6.0139e+011	1.4350e-004	5.3095e+000
La-141	6.5944e-003	2.4399e+008	5.8220e-008	2.1541e-003

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	9.1678e-006	3.3921e+005	8.0940e-011	2.9948e-006
Mo-99	5.0154e+000	1.8557e+011	4.4280e-005	1.6384e+000
Nb-95	4.9033e-001	1.8142e+010	4.3290e-006	1.6017e-001
Nd-147	1.7420e-001	6.4455e+009	1.5380e-006	5.6906e-002
Np-239	1.0095e+001	3.7353e+011	8.9130e-005	3.2978e+000
Pr-143	4.3086e-001	1.5942e+010	3.8040e-006	1.4075e-001
Pr-144	9.5000e-001	3.5150e+010	8.3873e-006	3.1033e-001
Pu-238	2.9121e-003	1.0775e+008	2.5710e-008	9.5127e-004
Pu-239	3.1012e-004	1.1475e+007	2.7380e-009	1.0131e-004
Pu-240	4.9724e-004	1.8398e+007	4.3900e-009	1.6243e-004
Pu-241	1.2267e-001	4.5387e+009	1.0830e-006	4.0071e-002
Rb-86	7.7214e-001	2.8569e+010	6.8170e-006	2.5223e-001
Rh-103m	5.3897e+000	1.9942e+011	4.7585e-005	1.7606e+000
Rh-105	2.5417e+000	9.4043e+010	2.2440e-005	8.3028e-001
Rh-106	2.1860e+000	8.0883e+010	1.9300e-005	7.1410e-001
Ru-103	5.4039e+000	1.9995e+011	4.7710e-005	1.7653e+000
Ru-105	8.9662e-002	3.3175e+009	7.9160e-007	2.9289e-002
Ru-106	2.1860e+000	8.0883e+010	1.9300e-005	7.1410e-001
Sb-127	5.0143e+000	1.8553e+011	4.4270e-005	1.6380e+000
Sb-129	4.7164e-001	1.7451e+010	4.1640e-006	1.5407e-001
Sr-89	2.5915e+001	9.5887e+011	2.2880e-004	8.4656e+000
Sr-90	3.3493e+000	1.2392e+011	2.9570e-005	1.0941e+000
Sr-91	5.8140e+000	2.1512e+011	5.1330e-005	1.8992e+000
Sr-92	7.6727e-002	2.8389e+009	6.7740e-007	2.5064e-002
Tc-99m	5.0268e+000	1.8599e+011	4.4380e-005	1.6421e+000
Te-127	5.5976e+000	2.0711e+011	4.9420e-005	1.8285e+000
Te-127m	1.0149e+000	3.7550e+010	8.9600e-006	3.3152e-001
Te-129	4.2849e+000	1.5854e+011	3.7830e-005	1.3997e+000
Te-129m	4.1897e+000	1.5502e+011	3.6990e-005	1.3686e+000
Te-131m	7.8867e+000	2.9181e+011	6.9630e-005	2.5763e+000
Te-132	7.9558e+001	2.9437e+012	7.0240e-004	2.5989e+001
Xe-133	2.0150e+005	7.4555e+015	1.7790e+000	6.5823e+004
Xe-135	1.4464e+004	5.3517e+014	1.2770e-001	4.7249e+003
Y-90	7.6398e-001	2.8267e+010	6.7450e-006	2.4956e-001
Y-91	4.0878e-001	1.5125e+010	3.6090e-006	1.3353e-001
Y-92	7.7078e-001	2.8519e+010	6.8050e-006	2.5179e-001
Y-93	5.2601e-002	1.9462e+009	4.6440e-007	1.7183e-002
Zr-95	4.8523e-001	1.7954e+010	4.2840e-006	1.5851e-001
Zr-97	1.8134e-001	6.7096e+009	1.6010e-006	5.9237e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.665e+07	0.000e+00	4.049e-29	0.000e+00	3.473e-30

DOS File: 2TB24.MS5
Run Date: June 26, 2008
Run Time: 9:25:18 AM
Duration: 00:00:12

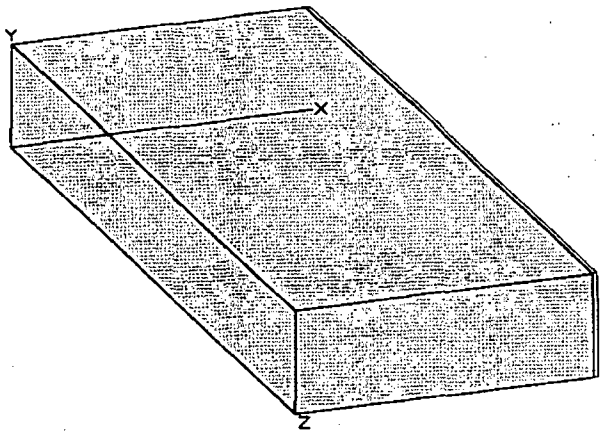
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.690e+10	2.925e-276	2.546e-25	1.013e-277	8.820e-27
0.03	3.608e+15	6.466e-86	4.719e-19	6.408e-88	4.676e-21
0.04	9.956e+10	2.624e-45	1.150e-22	1.160e-47	5.084e-25
0.05	3.871e+11	1.431e-28	4.058e-21	3.812e-31	1.081e-23
0.06	1.181e+11	7.585e-22	5.003e-18	1.507e-24	9.937e-21
0.08	2.737e+15	2.045e-11	1.776e-07	3.236e-14	2.810e-10
0.1	4.296e+11	1.008e-12	7.827e-09	1.541e-15	1.197e-11
0.15	2.200e+13	2.260e-08	9.029e-05	3.722e-11	1.487e-07
0.2	4.917e+14	1.080e-05	2.132e-02	1.907e-08	3.763e-05
0.3	6.772e+12	6.287e-06	4.088e-03	1.193e-08	7.755e-06
0.4	2.596e+13	2.832e-04	8.353e-02	5.518e-07	1.627e-04
0.5	2.710e+13	1.843e-03	3.055e-01	3.617e-06	5.997e-04
0.6	2.905e+13	8.328e-03	8.813e-01	1.626e-05	1.720e-03
0.8	1.180e+13	2.984e-02	1.657e+00	5.676e-05	3.151e-03
1.0	5.515e+12	6.952e-02	2.436e+00	1.281e-04	4.491e-03
1.5	5.938e+12	1.115e+00	1.896e+01	1.876e-03	3.190e-02
2.0	5.823e+12	5.937e+00	6.541e+01	9.181e-03	1.011e-01
3.0	8.768e+10	6.919e-01	4.616e+00	9.387e-04	6.263e-03
4.0	8.904e+03	2.383e-07	1.181e-06	2.948e-10	1.460e-09
TOTALS:	6.977e+15	7.854e+00	9.438e+01	1.220e-02	1.495e-01

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

Page : 1
DOS File: 2TB48.MS5
Run Date: June 26, 2008
Time: 9:25:54 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 2.5' Shield - 48 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	6.5978e-005	2.4412e+006	5.8250e-010	2.1553e-005
Ba-137m	5.5847e+001	2.0663e+012	4.9306e-004	1.8243e+001
Ba-139	1.6390e-009	6.0642e+001	1.4470e-014	5.3539e-010
Ba-140	4.4910e+001	1.6617e+012	3.9650e-004	1.4671e+001
Ce-141	1.1037e+000	4.0836e+010	9.7440e-006	3.6053e-001
Ce-143	3.8907e-001	1.4396e+010	3.4350e-006	1.2710e-001
Ce-144	9.6129e-001	3.5568e+010	8.4870e-006	3.1402e-001
Cm-242	1.6854e-002	6.2360e+008	1.4880e-007	5.5056e-003
Cm-244	9.9618e-004	3.6859e+007	8.7950e-009	3.2542e-004
Co-58	1.8564e-002	6.8688e+008	1.6390e-007	6.0643e-003
Co-60	1.0180e-002	3.7667e+008	8.9880e-008	3.3256e-003
Cs-134	7.8312e+001	2.8976e+012	6.9140e-004	2.5582e+001
Cs-136	2.2540e+001	8.3398e+011	1.9900e-004	7.3630e+000
Cs-137	5.9034e+001	2.1843e+012	5.2120e-004	1.9284e+001
I-131	8.7498e+002	3.2374e+013	7.7250e-003	2.8583e+002
I-132	7.6749e+001	2.8397e+012	6.7760e-004	2.5071e+001
I-133	4.3585e+002	1.6126e+013	3.8480e-003	1.4238e+002
I-134				
I-135	1.3343e+001	4.9368e+011	1.1780e-004	4.3586e+000
Kr-85	3.3595e+003	1.2430e+014	2.9660e-002	1.0974e+003
Kr-85m	3.6234e+001	1.3407e+012	3.1990e-004	1.1836e+001
Kr-87	5.2827e-007	1.9546e+004	4.6640e-012	1.7257e-007
Kr-88	1.3830e+000	5.1170e+010	1.2210e-005	4.5177e-001
La-140	2.6470e+001	9.7940e+011	2.3370e-004	8.6469e+000
La-141	9.5665e-005	3.5396e+006	8.4460e-010	3.1250e-005

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	1.8870e-010	6.9820e+000	1.6660e-015	6.1642e-011
Mo-99	3.8975e+000	1.4421e+011	3.4410e-005	1.2732e+000
Nb-95	4.9010e-001	1.8134e+010	4.3270e-006	1.6010e-001
Nd-147	1.6344e-001	6.0474e+009	1.4430e-006	5.3391e-002
Np-239	7.5209e+000	2.7827e+011	6.6400e-005	2.4568e+000
Pr-143	4.3460e-001	1.6080e+010	3.8370e-006	1.4197e-001
Pr-144	9.4754e-001	3.5059e+010	8.3656e-006	3.0953e-001
Pu-238	2.9109e-003	1.0770e+008	2.5700e-008	9.5090e-004
Pu-239	3.1069e-004	1.1496e+007	2.7430e-009	1.0149e-004
Pu-240	4.9713e-004	1.8394e+007	4.3890e-009	1.6239e-004
Pu-241	1.2255e-001	4.5345e+009	1.0820e-006	4.0034e-002
Rb-86	8.0294e-001	2.9709e+010	7.0890e-006	2.6229e-001
Rh-103m	5.2948e+000	1.9591e+011	4.6747e-005	1.7296e+000
Rh-105	1.5959e+000	5.9049e+010	1.4090e-005	5.2133e-001
Rh-106	2.1815e+000	8.0716e+010	1.9260e-005	7.1262e-001
Ru-103	5.3088e+000	1.9643e+011	4.6870e-005	1.7342e+000
Ru-105	2.1147e-003	7.8243e+007	1.8670e-008	6.9079e-004
Ru-106	2.1815e+000	8.0716e+010	1.9260e-005	7.1262e-001
Sb-127	4.1875e+000	1.5494e+011	3.6970e-005	1.3679e+000
Sb-129	1.0027e-002	3.7102e+008	8.8530e-008	3.2756e-003
Sr-89	2.5564e+001	9.4588e+011	2.2570e-004	8.3509e+000
Sr-90	3.3482e+000	1.2388e+011	2.9560e-005	1.0937e+000
Sr-91	1.0090e+000	3.7332e+010	8.9080e-006	3.2960e-001
Sr-92	1.6560e-004	6.1270e+006	1.4620e-009	5.4094e-005
Tc-99m	3.9892e+000	1.4760e+011	3.5220e-005	1.3031e+000
Te-127	4.9645e+000	1.8369e+011	4.3830e-005	1.6217e+000
Te-127m	1.0136e+000	3.7504e+010	8.9490e-006	3.3111e-001
Te-129	3.5622e+000	1.3180e+011	3.1450e-005	1.1637e+000
Te-129m	4.1036e+000	1.5183e+011	3.6230e-005	1.3405e+000
Te-131m	4.5295e+000	1.6759e+011	3.9990e-005	1.4796e+000
Te-132	6.4301e+001	2.3791e+012	5.6770e-004	2.1005e+001
Xe-133	3.7174e+005	1.3754e+016	3.2820e+000	1.2143e+005
Xe-135	4.9067e+003	1.8155e+014	4.3320e-002	1.6028e+003
Y-90	1.3592e+000	5.0290e+010	1.2000e-005	4.4400e-001
Y-91	4.1750e-001	1.5447e+010	3.6860e-006	1.3638e-001
Y-92	8.9378e-003	3.3070e+008	7.8910e-008	2.9197e-003
Y-93	1.0129e-002	3.7479e+008	8.9430e-008	3.3089e-003
Zr-95	4.7991e-001	1.7757e+010	4.2370e-006	1.5677e-001
Zr-97	6.7767e-002	2.5074e+009	5.9830e-007	2.2137e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.518e+07	0.000e+00	3.692e-29	0.000e+00	3.167e-30

For Information Only
DOS File: 2TB48.MS5
Run Date: June 26, 2008
Run Time: 9:25:54 AM
Duration: 00:00:12

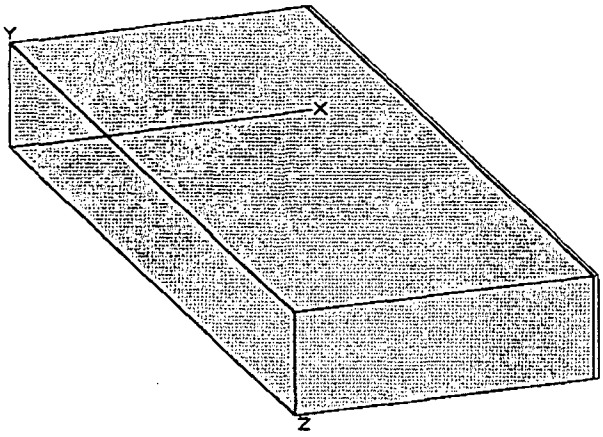
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.234e+10	2.563e-276	2.232e-25	8.879e-278	7.730e-27
0.03	6.611e+15	1.185e-85	8.646e-19	1.174e-87	8.569e-21
0.04	9.305e+10	2.452e-45	1.074e-22	1.084e-47	4.752e-25
0.05	3.130e+11	1.157e-28	3.281e-21	3.082e-31	8.740e-24
0.06	1.111e+11	7.136e-22	4.707e-18	1.417e-24	9.349e-21
0.08	5.049e+15	3.772e-11	3.276e-07	5.969e-14	5.184e-10
0.1	3.130e+11	7.342e-13	5.703e-09	1.123e-15	8.726e-12
0.15	1.945e+12	1.999e-09	7.984e-06	3.291e-12	1.315e-08
0.2	1.754e+14	3.854e-06	7.607e-03	6.803e-09	1.343e-05
0.3	3.396e+12	3.153e-06	2.050e-03	5.981e-09	3.889e-06
0.4	2.765e+13	3.017e-04	8.898e-02	5.878e-07	1.734e-04
0.5	1.686e+13	1.146e-03	1.900e-01	2.250e-06	3.730e-04
0.6	1.738e+13	4.983e-03	5.273e-01	9.726e-06	1.029e-03
0.8	8.726e+12	2.207e-02	1.225e+00	4.198e-05	2.331e-03
1.0	2.519e+12	3.175e-02	1.113e+00	5.853e-05	2.051e-03
1.5	2.144e+12	4.025e-01	6.846e+00	6.772e-04	1.152e-02
2.0	1.943e+11	1.981e-01	2.182e+00	3.063e-04	3.375e-03
3.0	3.527e+10	2.783e-01	1.857e+00	3.776e-04	2.519e-03
4.0	1.833e-01	4.904e-12	2.430e-11	6.067e-15	3.006e-14
TOTALS:	1.192e+16	9.392e-01	1.404e+01	1.474e-03	2.339e-02

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

Page : 1
DOS File: 2TB96.MS5
Run Date: June 26, 2008
Time: 9:27:00 AM
Duration: 00:00:19

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

Case Title: TB Dose
Description: 2.5' Shield - 96 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	6.7031e-005	2.4801e+006	5.9180e-010	2.1897e-005
Ba-137m	5.7025e+001	2.1099e+012	5.0346e-004	1.8628e+001
Ba-139				
Ba-140	4.0266e+001	1.4898e+012	3.5550e-004	1.3154e+001
Ce-141	1.0573e+000	3.9122e+010	9.3350e-006	3.4540e-001
Ce-143	1.4192e-001	5.2511e+009	1.2530e-006	4.6361e-002
Ce-144	9.5631e-001	3.5383e+010	8.4430e-006	3.1239e-001
Cm-242	1.6707e-002	6.1815e+008	1.4750e-007	5.4575e-003
Cm-244	9.9572e-004	3.6842e+007	8.7910e-009	3.2527e-004
Co-58	1.8202e-002	6.7347e+008	1.6070e-007	5.9459e-003
Co-60	1.0170e-002	3.7630e+008	8.9790e-008	3.3222e-003
Cs-134	7.9819e+001	2.9533e+012	7.0470e-004	2.6074e+001
Cs-136	2.0705e+001	7.6609e+011	1.8280e-004	6.7636e+000
Cs-137	6.0280e+001	2.2304e+012	5.3220e-004	1.9691e+001
I-131	1.1227e+003	4.1540e+013	9.9120e-003	3.6674e+002
I-132	5.0143e+001	1.8553e+012	4.4270e-004	1.6380e+001
I-133	1.3422e+002	4.9662e+012	1.1850e-003	4.3845e+001
I-134				
I-135	1.3263e-001	4.9075e+009	1.1710e-006	4.3327e-002
Kr-85	8.6298e+003	3.1930e+014	7.6190e-002	2.8190e+003
Kr-85m	5.5433e-002	2.0510e+009	4.8940e-007	1.8108e-002
Kr-87				
Kr-88	2.9041e-005	1.0745e+006	2.5640e-010	9.4868e-006
La-140	3.5532e+001	1.3147e+012	3.1370e-004	1.1607e+001
La-141	2.0127e-008	7.4471e+002	1.7770e-013	6.5749e-009

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	2.3537e+000	8.7086e+010	2.0780e-005	7.6886e-001
Nb-95	4.8920e-001	1.8100e+010	4.3190e-006	1.5980e-001
Nd-147	1.4407e-001	5.3308e+009	1.2720e-006	4.7064e-002
Np-239	4.1739e+000	1.5443e+011	3.6850e-005	1.3635e+000
Pr-143	4.1591e-001	1.5389e+010	3.6720e-006	1.3586e-001
Pr-144	9.4263e-001	3.4877e+010	8.3223e-006	3.0792e-001
Pu-238	2.9109e-003	1.0770e+008	2.5700e-008	9.5090e-004
Pu-239	3.1148e-004	1.1525e+007	2.7500e-009	1.0175e-004
Pu-240	4.9701e-004	1.8389e+007	4.3880e-009	1.6236e-004
Pu-241	1.2255e-001	4.5345e+009	1.0820e-006	4.0034e-002
Rb-86	8.5935e-001	3.1796e+010	7.5870e-006	2.8072e-001
Rh-103m	5.1096e+000	1.8905e+011	4.5111e-005	1.6691e+000
Rh-105	6.2262e-001	2.3037e+010	5.4970e-006	2.0339e-001
Rh-106	2.1724e+000	8.0381e+010	1.9180e-005	7.0966e-001
Ru-103	5.1230e+000	1.8955e+011	4.5230e-005	1.6735e+000
Ru-105	1.1768e-006	4.3543e+004	1.0390e-011	3.8443e-007
Ru-106	2.1724e+000	8.0381e+010	1.9180e-005	7.0966e-001
Sb-127	2.9200e+000	1.0804e+011	2.5780e-005	9.5386e-001
Sb-129	4.5318e-006	1.6768e+005	4.0010e-011	1.4804e-006
Sr-89	2.4862e+001	9.1989e+011	2.1950e-004	8.1215e+000
Sr-90	3.3470e+000	1.2384e+011	2.9550e-005	1.0934e+000
Sr-91	3.0389e-002	1.1244e+009	2.6830e-007	9.9271e-003
Sr-92	7.7078e-010	2.8519e+001	6.8050e-015	2.5179e-010
Tc-99m	2.4137e+000	8.9307e+010	2.1310e-005	7.8847e-001
Te-127	3.7899e+000	1.4023e+011	3.3460e-005	1.2380e+000
Te-127m	1.0085e+000	3.7315e+010	8.9040e-006	3.2945e-001
Te-129	3.4037e+000	1.2594e+011	3.0050e-005	1.1118e+000
Te-129m	3.9371e+000	1.4567e+011	3.4760e-005	1.2861e+000
Te-131m	1.4940e+000	5.5277e+010	1.3190e-005	4.8803e-001
Te-132	4.2010e+001	1.5544e+012	3.7090e-004	1.3723e+001
Xe-133	7.3363e+005	2.7144e+016	6.4770e+000	2.3965e+005
Xe-135	3.2598e+002	1.2061e+013	2.8780e-003	1.0649e+002
Y-90	2.1724e+000	8.0381e+010	1.9180e-005	7.0966e-001
Y-91	4.1036e-001	1.5183e+010	3.6230e-006	1.3405e-001
Y-92	7.8686e-007	2.9114e+004	6.9470e-012	2.5704e-007
Y-93	3.7570e-004	1.3901e+007	3.3170e-009	1.2273e-004
Zr-95	4.6949e-001	1.7371e+010	4.1450e-006	1.5336e-001
Zr-97	9.4600e-003	3.5002e+008	8.3520e-008	3.0902e-003

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.482e+07	0.000e+00	3.604e-29	0.000e+00	3.091e-30

DOS File: 2TB96.MS5
Run Date: June 26, 2008
Run Time: 9:27:00 AM
Duration: 00:00:19

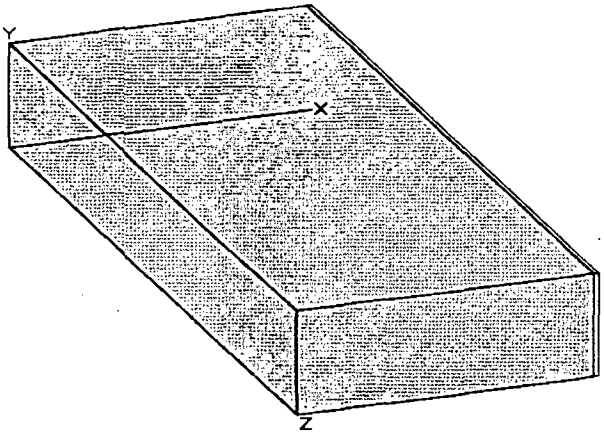
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.556e+10	2.026e-276	1.764e-25	7.017e-278	6.109e-27
0.03	1.302e+16	2.334e-85	1.704e-18	2.313e-87	1.688e-20
0.04	8.510e+10	2.243e-45	9.827e-23	9.919e-48	4.346e-25
0.05	2.047e+11	7.566e-29	2.146e-21	2.016e-31	5.716e-24
0.06	9.953e+10	6.393e-22	4.216e-18	1.270e-24	8.374e-21
0.08	9.963e+15	7.444e-11	6.465e-07	1.178e-13	1.023e-09
0.1	1.832e+11	4.298e-13	3.338e-09	6.575e-16	5.108e-12
0.15	3.602e+11	3.700e-10	1.478e-06	6.093e-13	2.434e-09
0.2	3.180e+13	6.987e-07	1.379e-03	1.233e-09	2.434e-06
0.3	3.665e+12	3.402e-06	2.212e-03	6.454e-09	4.197e-06
0.4	3.399e+13	3.708e-04	1.094e-01	7.226e-07	2.131e-04
0.5	7.645e+12	5.198e-04	8.619e-02	1.020e-06	1.692e-04
0.6	1.148e+13	3.291e-03	3.482e-01	6.423e-06	6.797e-04
0.8	7.007e+12	1.772e-02	9.838e-01	3.371e-05	1.871e-03
1.0	1.677e+12	2.114e-02	7.407e-01	3.896e-05	1.365e-03
1.5	1.760e+12	3.304e-01	5.620e+00	5.559e-04	9.455e-03
2.0	7.525e+10	7.672e-02	8.452e-01	1.186e-04	1.307e-03
3.0	4.681e+10	3.694e-01	2.465e+00	5.012e-04	3.344e-03
TOTALS:	2.309e+16	8.196e-01	1.120e+01	1.257e-03	1.841e-02

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

Page : 1
DOS File: 2TB240.MS5
Run Date: June 26, 2008
Run Time: 9:25:31 AM
Duration: 00:00:11

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

Case Title: TB Dose
Description: 2.5' Shield - 240 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	7.0191e-005	2.5971e+006	6.1970e-010	2.2929e-005
Ba-137m	5.9983e+001	2.2194e+012	5.2957e-004	1.9594e+001
Ba-139				
Ba-140	2.9030e+001	1.0741e+012	2.5630e-004	9.4831e+000
Ce-141	9.2946e-001	3.4390e+010	8.2060e-006	3.0362e-001
Ce-143	6.8889e-003	2.5489e+008	6.0820e-008	2.2503e-003
Ce-144	9.4158e-001	3.4839e+010	8.3130e-006	3.0758e-001
Cm-242	1.6276e-002	6.0223e+008	1.4370e-007	5.3169e-003
Cm-244	9.9414e-004	3.6783e+007	8.7770e-009	3.2475e-004
Co-58	1.7149e-002	6.3450e+008	1.5140e-007	5.6018e-003
Co-60	1.0140e-002	3.7517e+008	8.9520e-008	3.3122e-003
Cs-134	8.3523e+001	3.0903e+012	7.3740e-004	2.7284e+001
Cs-136	1.5857e+001	5.8672e+011	1.4000e-004	5.1800e+000
Cs-137	6.3406e+001	2.3460e+012	5.5980e-004	2.0713e+001
I-131	1.5370e+003	5.6870e+013	1.3570e-002	5.0209e+002
I-132	1.3977e+001	5.1715e+011	1.2340e-004	4.5658e+000
I-133	2.5417e+000	9.4043e+010	2.2440e-005	8.3028e-001
I-134				
I-135	8.4327e-008	3.1201e+003	7.4450e-013	2.7547e-008
Kr-85	3.6234e+004	1.3407e+015	3.1990e-001	1.1836e+004
Kr-85m	4.6700e-011	1.7279e+000	4.1230e-016	1.5255e-011
Kr-87				
Kr-88				
La-140	3.2779e+001	1.2128e+012	2.8940e-004	1.0708e+001
La-141				

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	5.1831e-001	1.9177e+010	4.5760e-006	1.6931e-001
Nb-95	4.8433e-001	1.7920e+010	4.2760e-006	1.5821e-001
Nd-147	9.8542e-002	3.6460e+009	8.7000e-007	3.2190e-002
Np-239	7.1312e-001	2.6386e+010	6.2960e-006	2.3295e-001
Pr-143	3.1681e-001	1.1722e+010	2.7970e-006	1.0349e-001
Pr-144	9.2812e-001	3.4340e+010	8.1941e-006	3.0318e-001
Pu-238	2.9109e-003	1.0770e+008	2.5700e-008	9.5090e-004
Pu-239	3.1216e-004	1.1550e+007	2.7560e-009	1.0197e-004
Pu-240	4.9656e-004	1.8373e+007	4.3840e-009	1.6221e-004
Pu-241	1.2233e-001	4.5261e+009	1.0800e-006	3.9960e-002
Rb-86	9.5234e-001	3.5237e+010	8.4080e-006	3.1110e-001
Rh-103m	4.5922e+000	1.6991e+011	4.0543e-005	1.5001e+000
Rh-105	3.6970e-002	1.3679e+009	3.2640e-007	1.2077e-002
Rh-106	2.1464e+000	7.9417e+010	1.8950e-005	7.0115e-001
Ru-103	4.6043e+000	1.7036e+011	4.0650e-005	1.5041e+000
Ru-105				
Ru-106	2.1464e+000	7.9417e+010	1.8950e-005	7.0115e-001
Sb-127	9.9063e-001	3.6653e+010	8.7460e-006	3.2360e-001
Sb-129				
Sr-89	2.2880e+001	8.4655e+011	2.0200e-004	7.4740e+000
Sr-90	3.3425e+000	1.2367e+011	2.9510e-005	1.0919e+000
Sr-91	8.3069e-007	3.0736e+004	7.3340e-012	2.7136e-007
Sr-92				
Tc-99m	5.3145e-001	1.9663e+010	4.6920e-006	1.7360e-001
Te-127	1.9391e+000	7.1747e+010	1.7120e-005	6.3344e-001
Te-127m	9.8191e-001	3.6331e+010	8.6690e-006	3.2075e-001
Te-129	3.0050e+000	1.1118e+011	2.6530e-005	9.8161e-001
Te-129m	3.4750e+000	1.2858e+011	3.0680e-005	1.1352e+000
Te-131m	5.3575e-002	1.9823e+009	4.7300e-007	1.7501e-002
Te-132	1.1712e+001	4.3333e+011	1.0340e-004	3.8258e+000
Xe-133	1.3954e+006	5.1631e+016	1.2320e+001	4.5584e+005
Xe-135	2.3220e-002	8.5912e+008	2.0500e-007	7.5850e-003
Y-90	3.1114e+000	1.1512e+011	2.7470e-005	1.0164e+000
Y-91	3.8193e-001	1.4132e+010	3.3720e-006	1.2476e-001
Y-92				
Y-93	1.9165e-008	7.0909e+002	1.6920e-013	6.2604e-009
Zr-95	4.3959e-001	1.6265e+010	3.8810e-006	1.4360e-001
Zr-97	2.5734e-005	9.5216e+005	2.2720e-010	8.4064e-006

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.466e+07	0.000e+00	3.565e-29	0.000e+00	3.058e-30

Page : 3
DOS File: 2TB240.MS5
Run Date: June 26, 2008
Run Time: 9:25:31 AM
Duration: 00:00:11

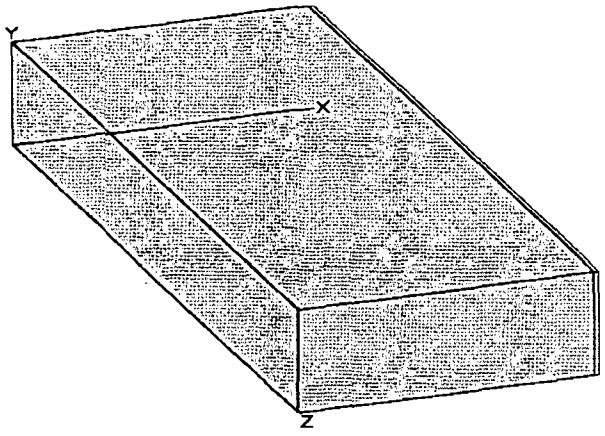
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.660e+10	1.316e-276	1.145e-25	4.557e-278	3.968e-27
0.03	2.477e+16	4.439e-85	3.240e-18	4.400e-87	3.211e-20
0.04	7.369e+10	1.942e-45	8.509e-23	8.588e-48	3.763e-25
0.05	5.748e+10	2.125e-29	6.026e-22	5.660e-32	1.605e-24
0.06	7.415e+10	4.762e-22	3.141e-18	9.459e-25	6.239e-21
0.08	1.895e+16	1.416e-10	1.230e-06	2.241e-13	1.946e-09
0.1	4.231e+10	9.924e-14	7.710e-10	1.518e-16	1.179e-12
0.15	1.975e+11	2.029e-10	8.107e-07	3.342e-13	1.335e-09
0.2	3.738e+13	8.213e-07	1.621e-03	1.450e-09	2.861e-06
0.3	4.407e+12	4.091e-06	2.660e-03	7.761e-09	5.046e-06
0.4	4.627e+13	5.048e-04	1.489e-01	9.836e-07	2.901e-04
0.5	7.297e+12	4.961e-04	8.227e-02	9.739e-07	1.615e-04
0.6	1.071e+13	3.070e-03	3.249e-01	5.991e-06	6.341e-04
0.8	5.473e+12	1.384e-02	7.685e-01	2.633e-05	1.462e-03
1.0	9.624e+11	1.213e-02	4.251e-01	2.236e-05	7.836e-04
1.5	1.335e+12	2.508e-01	4.265e+00	4.219e-04	7.175e-03
2.0	2.766e+10	2.820e-02	3.107e-01	4.361e-05	4.805e-04
3.0	4.319e+10	3.408e-01	2.274e+00	4.624e-04	3.085e-03
TOTALS:	4.383e+16	6.498e-01	8.603e+00	9.845e-04	1.408e-02

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

Page : 1
DOS File: 2TB480.MS5
Run Date: June 26, 2008
Run Time: 9:26:07 AM
Duration: 00:00:11

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

Case Title: TB Dose
Description: 2.5' Shield - 480 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	7.5447e-005	2.7915e+006	6.6610e-010	2.4646e-005
Ba-137m	6.3443e+001	2.3474e+012	5.6013e-004	2.0725e+001
Ba-139				
Ba-140	1.6820e+001	6.2234e+011	1.4850e-004	5.4945e+000
Ce-141	7.4994e-001	2.7748e+010	6.6210e-006	2.4498e-001
Ce-143	4.4480e-005	1.6457e+006	3.9270e-010	1.4530e-005
Ce-144	9.1768e-001	3.3954e+010	8.1020e-006	2.9977e-001
Cm-242	1.5574e-002	5.7624e+008	1.3750e-007	5.0875e-003
Cm-244	9.9176e-004	3.6695e+007	8.7560e-009	3.2397e-004
Co-58	1.5529e-002	5.7457e+008	1.3710e-007	5.0727e-003
Co-60	1.0089e-002	3.7328e+008	8.9070e-008	3.2956e-003
Cs-134	8.7589e+001	3.2408e+012	7.7330e-004	2.8612e+001
Cs-136	9.8870e+000	3.6582e+011	8.7290e-005	3.2297e+000
Cs-137	6.7065e+001	2.4814e+012	5.9210e-004	2.1908e+001
I-131	1.4362e+003	5.3140e+013	1.2680e-002	4.6916e+002
I-132	1.6639e+000	6.1564e+010	1.4690e-005	5.4353e-001
I-133	1.8904e-003	6.9945e+007	1.6690e-008	6.1753e-004
I-134				
I-135				
Kr-85	1.0982e+005	4.0635e+015	9.6960e-001	3.5875e+004
Kr-85m				
Kr-87				
Kr-88				
La-140	1.9527e+001	7.2250e+011	1.7240e-004	6.3788e+000
La-141				

DOS File: 2TB480.MS5
Run Date: June 26, 2008
Run Time: 9:26:07 AM
Duration: 00:00:11

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	4.1625e-002	1.5401e+009	3.6750e-007	1.3598e-002
Nb-95	4.7073e-001	1.7417e+010	4.1560e-006	1.5377e-001
Nd-147	5.2340e-002	1.9366e+009	4.6210e-007	1.7098e-002
Np-239	3.7525e-002	1.3884e+009	3.3130e-007	1.2258e-002
Pr-143	1.9017e-001	7.0364e+009	1.6790e-006	6.2123e-002
Pr-144	9.0456e-001	3.3469e+010	7.9861e-006	2.9549e-001
Pu-238	2.9087e-003	1.0762e+008	2.5680e-008	9.5016e-004
Pu-239	3.1194e-004	1.1542e+007	2.7540e-009	1.0190e-004
Pu-240	4.9588e-004	1.8348e+007	4.3780e-009	1.6199e-004
Pu-241	1.2199e-001	4.5135e+009	1.0770e-006	3.9849e-002
Rb-86	8.9243e-001	3.3020e+010	7.8790e-006	2.9152e-001
Rh-103m	3.8443e+000	1.4224e+011	3.3941e-005	1.2558e+000
Rh-105	3.3425e-004	1.2367e+007	2.9510e-009	1.0919e-004
Rh-106	2.1034e+000	7.7824e+010	1.8570e-005	6.8709e-001
Ru-103	3.8545e+000	1.4261e+011	3.4030e-005	1.2591e+000
Ru-105				
Ru-106	2.1034e+000	7.7824e+010	1.8570e-005	6.8709e-001
Sb-127	1.6344e-001	6.0474e+009	1.4430e-006	5.3391e-002
Sb-129				
Sr-89	1.9912e+001	7.3675e+011	1.7580e-004	6.5046e+000
Sr-90	3.3357e+000	1.2342e+011	2.9450e-005	1.0897e+000
Sr-91				
Sr-92				
Tc-99m	4.2667e-002	1.5787e+009	3.7670e-007	1.3938e-002
Te-127	1.0986e+000	4.0647e+010	9.6990e-006	3.5886e-001
Te-127m	9.2505e-001	3.4227e+010	8.1670e-006	3.0218e-001
Te-129	2.4420e+000	9.0355e+010	2.1560e-005	7.9772e-001
Te-129m	2.8237e+000	1.0448e+011	2.4930e-005	9.2241e-001
Te-131m	2.0898e-004	7.7321e+006	1.8450e-009	6.8265e-005
Te-132	1.3932e+000	5.1547e+010	1.2300e-005	4.5510e-001
Xe-133	1.1296e+006	4.1795e+016	9.9730e+000	3.6900e+005
Xe-135	7.8935e-010	2.9206e+001	6.9690e-015	2.5785e-010
Y-90	3.3357e+000	1.2342e+011	2.9450e-005	1.0897e+000
Y-91	3.3878e-001	1.2535e+010	2.9910e-006	1.1067e-001
Y-92				
Y-93				
Zr-95	3.9394e-001	1.4576e+010	3.4780e-006	1.2869e-001
Zr-97	1.3649e-009	5.0500e+001	1.2050e-014	4.4585e-010

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.425e+07	0.000e+00	3.465e-29	0.000e+00	2.972e-30

DOS File: 2TB480.MS5
Run Date: June 26, 2008
Run Time: 9:26:07 AM
Duration: 00:00:11

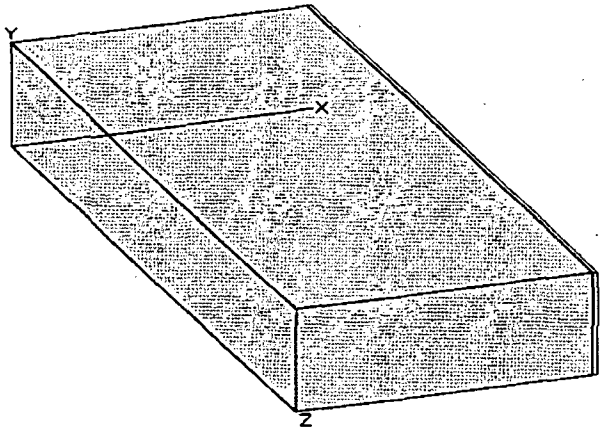
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.235e+10	9.784e-277	8.518e-26	3.389e-278	2.951e-27
0.03	2.005e+16	3.594e-85	2.623e-18	3.561e-87	2.599e-20
0.04	6.281e+10	1.655e-45	7.253e-23	7.321e-48	3.208e-25
0.05	7.293e+09	2.696e-30	7.646e-23	7.182e-33	2.037e-25
0.06	4.587e+10	2.946e-22	1.943e-18	5.852e-25	3.859e-21
0.08	1.534e+16	1.146e-10	9.954e-07	1.814e-13	1.575e-09
0.1	6.977e+09	1.636e-14	1.271e-10	2.503e-17	1.945e-13
0.15	1.133e+11	1.164e-10	4.651e-07	1.917e-13	7.659e-10
0.2	2.999e+13	6.590e-07	1.301e-03	1.163e-09	2.296e-06
0.3	3.882e+12	3.605e-06	2.344e-03	6.838e-09	4.446e-06
0.4	4.319e+13	4.712e-04	1.390e-01	9.181e-07	2.708e-04
0.5	1.853e+13	1.260e-03	2.090e-01	2.474e-06	4.102e-04
0.6	1.012e+13	2.903e-03	3.072e-01	5.666e-06	5.996e-04
0.8	4.710e+12	1.191e-02	6.614e-01	2.266e-05	1.258e-03
1.0	5.567e+11	7.016e-03	2.459e-01	1.293e-05	4.532e-04
1.5	7.990e+11	1.500e-01	2.552e+00	2.524e-04	4.293e-03
2.0	8.430e+09	8.595e-03	9.469e-02	1.329e-05	1.464e-04
3.0	2.573e+10	2.030e-01	1.355e+00	2.754e-04	1.838e-03
TOTALS:	3.550e+16	3.852e-01	5.567e+00	5.858e-04	9.276e-03

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

Page : 1
DOS File: 2TB720.MS5
Run Date: June 26, 2008
Run Time: 9:26:19 AM
Duration: 00:00:19

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

Case Title: TB Dose
Description: 2.5' Shield - 720 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5059.68 cm	868.68 cm	6.56e+03 cm
	166 ft 0.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	76.2 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/cm³	Bq/cm³
Am-241	8.0680e-005	2.9851e+006	7.1230e-010	2.6355e-005
Ba-137m	6.5640e+001	2.4287e+012	5.7952e-004	2.1442e+001
Ba-139				
Ba-140	9.7500e+000	3.6075e+011	8.6080e-005	3.1850e+000
Ce-141	6.0496e-001	2.2383e+010	5.3410e-006	1.9762e-001
Ce-143	2.8724e-007	1.0628e+004	2.5360e-012	9.3832e-008
Ce-144	8.9424e-001	3.3087e+010	7.8950e-006	2.9211e-001
Cm-242	1.4906e-002	5.5152e+008	1.3160e-007	4.8692e-003
Cm-244	9.8927e-004	3.6603e+007	8.7340e-009	3.2316e-004
Co-58	1.4056e-002	5.2008e+008	1.2410e-007	4.5917e-003
Co-60	1.0038e-002	3.7139e+008	8.8620e-008	3.2789e-003
Cs-134	8.9854e+001	3.3246e+012	7.9330e-004	2.9352e+001
Cs-136	6.0303e+000	2.2312e+011	5.3240e-005	1.9699e+000
Cs-137	6.9387e+001	2.5673e+012	6.1260e-004	2.2666e+001
I-131	9.9029e+002	3.6641e+013	8.7430e-003	3.2349e+002
I-132	1.9788e-001	7.3214e+009	1.7470e-006	6.4639e-002
I-133	1.0384e-006	3.8422e+004	9.1680e-012	3.3922e-007
I-134				
I-135				
Kr-85	2.0252e+005	7.4932e+015	1.7880e+000	6.6156e+004
Kr-85m				
Kr-87				
Kr-88				
La-140	1.1325e+001	4.1904e+011	9.9990e-005	3.6996e+000
La-141				

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	3.3425e-003	1.2367e+008	2.9510e-008	1.0919e-003
Nb-95	4.5182e-001	1.6717e+010	3.9890e-006	1.4759e-001
Nd-147	2.7796e-002	1.0284e+009	2.4540e-007	9.0798e-003
Np-239	1.9742e-003	7.3047e+007	1.7430e-008	6.4491e-004
Pr-143	1.1395e-001	4.2160e+009	1.0060e-006	3.7222e-002
Pr-144	8.8145e-001	3.2614e+010	7.7821e-006	2.8794e-001
Pu-238	2.9075e-003	1.0758e+008	2.5670e-008	9.4979e-004
Pu-239	3.1148e-004	1.1525e+007	2.7500e-009	1.0175e-004
Pu-240	4.9520e-004	1.8322e+007	4.3720e-009	1.6176e-004
Pu-241	1.2165e-001	4.5010e+009	1.0740e-006	3.9738e-002
Rb-86	7.2275e-001	2.6742e+010	6.3810e-006	2.3610e-001
Rh-103m	3.2173e+000	1.1904e+011	2.8405e-005	1.0510e+000
Rh-105	3.0219e-006	1.1181e+005	2.6680e-011	9.8716e-007
Rh-106	2.0614e+000	7.6274e+010	1.8200e-005	6.7340e-001
Ru-103	3.2258e+000	1.1936e+011	2.8480e-005	1.0538e+000
Ru-105				
Ru-106	2.0614e+000	7.6274e+010	1.8200e-005	6.7340e-001
Sb-127	2.6969e-002	9.9784e+008	2.3810e-007	8.8097e-003
Sb-129				
Sr-89	1.7341e+001	6.4162e+011	1.5310e-004	5.6647e+000
Sr-90	3.3289e+000	1.2317e+011	2.9390e-005	1.0874e+000
Sr-91				
Sr-92				
Tc-99m	3.4263e-003	1.2677e+008	3.0250e-008	1.1193e-003
Te-127	9.1089e-001	3.3703e+010	8.0420e-006	2.9755e-001
Te-127m	8.6762e-001	3.2102e+010	7.6600e-006	2.8342e-001
Te-129	1.9833e+000	7.3382e+010	1.7510e-005	6.4787e-001
Te-129m	2.2936e+000	8.4865e+010	2.0250e-005	7.4925e-001
Te-131m	8.1506e-007	3.0157e+004	7.1960e-012	2.6625e-007
Te-132	1.6582e-001	6.1354e+009	1.4640e-006	5.4168e-002
Xe-133	5.5659e+005	2.0594e+016	4.9140e+000	1.8182e+005
Xe-135				
Y-90	3.3459e+000	1.2380e+011	2.9540e-005	1.0930e+000
Y-91	3.0050e-001	1.1118e+010	2.6530e-006	9.8161e-002
Y-92				
Y-93				
Zr-95	3.5294e-001	1.3059e+010	3.1160e-006	1.1529e-001
Zr-97				

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.368e+07	0.000e+00	3.326e-29	0.000e+00	2.853e-30

For Information Only
DOS File: 2TB720.MS5
Run Date: June 26, 2008
Run Time: 9:26:19 AM
Duration: 00:00:19

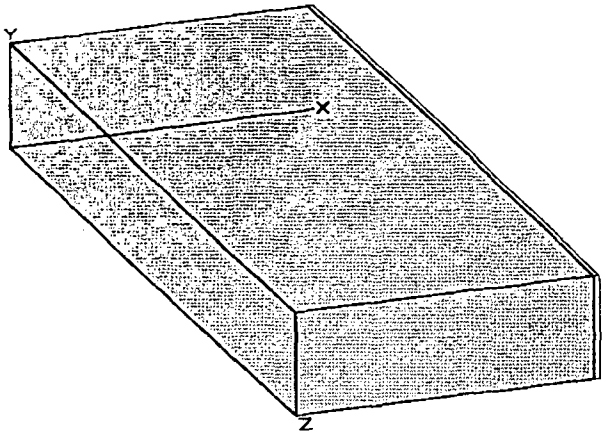
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.021e+10	8.090e-277	7.043e-26	2.802e-278	2.440e-27
0.03	9.880e+15	1.771e-85	1.292e-18	1.755e-87	1.281e-20
0.04	5.596e+10	1.475e-45	6.462e-23	6.522e-48	2.858e-25
0.05	1.250e+09	4.622e-31	1.311e-23	1.231e-33	3.492e-26
0.06	2.799e+10	1.798e-22	1.186e-18	3.571e-25	2.355e-21
0.08	7.559e+15	5.648e-11	4.905e-07	8.937e-14	7.761e-10
0.1	2.672e+09	6.266e-15	4.868e-11	9.587e-18	7.448e-14
0.15	7.080e+10	7.274e-11	2.906e-07	1.198e-13	4.785e-10
0.2	1.479e+13	3.251e-07	6.416e-04	5.737e-10	1.132e-06
0.3	2.638e+12	2.450e-06	1.593e-03	4.647e-09	3.021e-06
0.4	2.977e+13	3.248e-04	9.580e-02	6.329e-07	1.867e-04
0.5	3.312e+13	2.252e-03	3.734e-01	4.420e-06	7.329e-04
0.6	8.992e+12	2.578e-03	2.728e-01	5.032e-06	5.325e-04
0.8	4.192e+12	1.060e-02	5.886e-01	2.017e-05	1.120e-03
1.0	3.675e+11	4.632e-03	1.623e-01	8.538e-06	2.992e-04
1.5	5.034e+11	9.452e-02	1.608e+00	1.590e-04	2.705e-03
2.0	4.058e+09	4.138e-03	4.558e-02	6.398e-06	7.049e-05
3.0	1.492e+10	1.177e-01	7.856e-01	1.598e-04	1.066e-03
TOTALS:	1.753e+16	2.368e-01	3.934e+00	3.640e-04	6.716e-03

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

Page : 1
DOS File: 1TB01667.MS5
Run Date: June 25, 2008
Run Time: 11:28:16 AM
Duration: 00:00:09

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

Case Title: TB Dose
Description: 3' Shield - 0.1667 Hours
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Ba-137m	2.0283e-001	7.5049e+009	1.7908e-006	6.6259e-002
Cs-134	2.8486e-001	1.0540e+010	2.5150e-006	9.3055e-002
Cs-136	9.0908e-002	3.3636e+009	8.0260e-007	2.9696e-002
Cs-137	2.1441e-001	7.9333e+009	1.8930e-006	7.0041e-002
I-131	1.3275e+000	4.9117e+010	1.1720e-005	4.3364e-001
I-132	1.8632e+000	6.8940e+010	1.6450e-005	6.0865e-001
I-133	2.7467e+000	1.0163e+011	2.4250e-005	8.9725e-001
I-134	2.6708e+000	9.8820e+010	2.3580e-005	8.7246e-001
I-135	2.5757e+000	9.5300e+010	2.2740e-005	8.4138e-001
Kr-85	4.3370e-002	1.6047e+009	3.8290e-007	1.4167e-002
Kr-85m	7.6591e-001	2.8339e+010	6.7620e-006	2.5019e-001
Kr-87	1.4351e+000	5.3098e+010	1.2670e-005	4.6879e-001
Kr-88	2.0988e+000	7.7657e+010	1.8530e-005	6.8561e-001
Rb-86	2.6878e-003	9.9449e+007	2.3730e-008	8.7801e-004
Xe-133	6.2127e+000	2.2987e+011	5.4850e-005	2.0294e+000
Xe-135	2.0626e+000	7.6315e+010	1.8210e-005	6.7377e-001

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

DOS File: 1TB01667.MS5
Run Date: June 25, 2008
Run Time: 11:28:16 AM
Duration: 00:00:09

Results

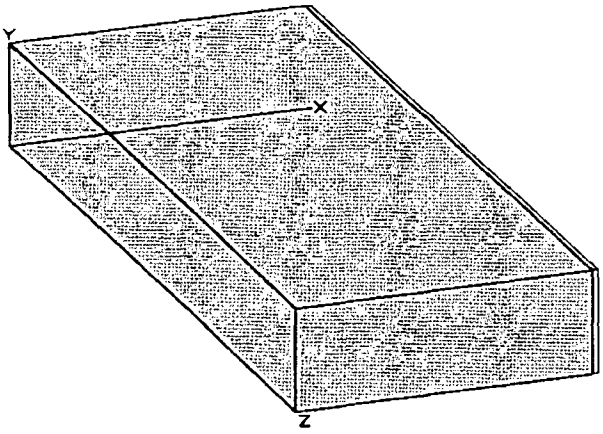
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.217e+11	3.100e-108	1.563e-23	3.072e-110	1.549e-25
0.04	2.312e+08	7.348e-57	2.620e-25	3.250e-59	1.159e-27
0.06	4.192e+08	1.218e-28	2.144e-23	2.418e-31	4.258e-26
0.08	8.586e+10	4.209e-19	6.617e-15	6.661e-22	1.047e-17
0.1	1.669e+08	7.521e-19	1.008e-14	1.151e-21	1.542e-17
0.15	2.939e+10	1.737e-13	1.241e-09	2.861e-16	2.044e-12
0.2	9.463e+10	2.038e-11	6.852e-08	3.597e-14	1.209e-10
0.3	1.580e+10	2.720e-10	2.788e-07	5.159e-13	5.289e-10
0.4	8.848e+10	2.708e-08	1.188e-05	5.276e-11	2.314e-08
0.5	1.277e+11	3.301e-07	7.804e-05	6.479e-10	1.532e-07
0.6	1.502e+11	2.077e-06	3.052e-04	4.055e-09	5.956e-07
0.8	2.842e+11	4.948e-05	3.652e-03	9.412e-08	6.947e-06
1.0	1.106e+11	1.244e-04	5.632e-03	2.293e-07	1.038e-05
1.5	9.421e+10	2.420e-03	5.081e-02	4.072e-06	8.549e-05
2.0	6.961e+10	1.259e-02	1.665e-01	1.946e-05	2.575e-04
3.0	8.024e+09	1.516e-02	1.181e-01	2.057e-05	1.602e-04
TOTALS:	1.281e+12	3.035e-02	3.451e-01	4.444e-05	5.212e-04

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

Page : 1
DOS File: 1TB0_5.MS5
Run Date: June 25, 2008
Run Time: 11:28:06 AM
Duration: 00:00:09

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

Case Title: TB Dose
Description: 3' Shield - 0.5 Hours
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Ba-137m	1.6833e+000	6.2283e+010	1.4862e-005	5.4988e-001
Cs-134	2.3639e+000	8.7463e+010	2.0870e-005	7.7219e-001
Cs-136	7.5390e-001	2.7894e+010	6.6560e-006	2.4627e-001
Cs-137	1.7794e+000	6.5838e+010	1.5710e-005	5.8127e-001
I-131	1.1054e+001	4.0899e+011	9.7590e-005	3.6108e+000
I-132	1.4532e+001	5.3769e+011	1.2830e-004	4.7471e+000
I-133	2.2642e+001	8.3775e+011	1.9990e-004	7.3963e+000
I-134	1.7103e+001	6.3282e+011	1.5100e-004	5.5870e+000
I-135	2.0739e+001	7.6735e+011	1.8310e-004	6.7747e+000
Kr-85	4.3664e-001	1.6156e+010	3.8550e-006	1.4264e-001
Kr-85m	7.3238e+000	2.7098e+011	6.4660e-005	2.3924e+000
Kr-87	1.2052e+001	4.4591e+011	1.0640e-004	3.9368e+000
Kr-88	1.9482e+001	7.2083e+011	1.7200e-004	6.3640e+000
Rb-86	2.2291e-002	8.2476e+008	1.9680e-007	7.2816e-003
Xe-133	6.2500e+001	2.3125e+012	5.5180e-004	2.0417e+001
Xe-135	2.0818e+001	7.7028e+011	1.8380e-004	6.8006e+000

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

For Information Only
DOS File: 1TB0_5.MS5
Run Date: June 25, 2008
Run Time: 11:28:06 AM
Duration: 00:00:09

Results

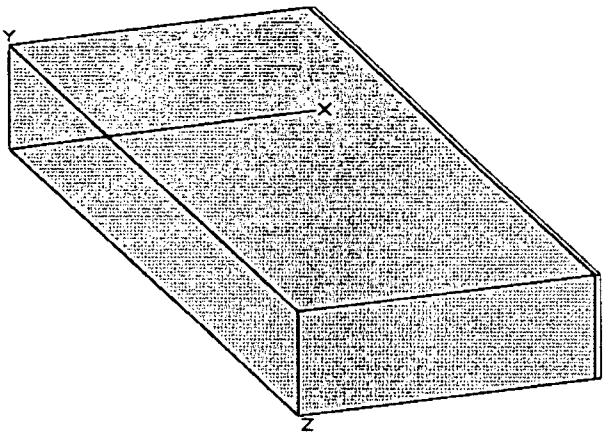
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.210e+12	3.081e-107	1.553e-22	3.053e-109	1.539e-24
0.04	1.918e+09	6.096e-56	2.174e-24	2.696e-58	9.613e-27
0.06	3.476e+09	1.010e-27	1.778e-22	2.006e-30	3.531e-25
0.08	8.611e+11	4.222e-18	6.636e-14	6.681e-21	1.050e-16
0.1	1.536e+09	6.920e-18	9.275e-14	1.059e-20	1.419e-16
0.15	2.646e+11	1.564e-12	1.118e-08	2.576e-15	1.840e-11
0.2	9.227e+11	1.987e-10	6.682e-07	3.507e-13	1.179e-09
0.3	1.334e+11	2.297e-09	2.355e-06	4.358e-12	4.468e-09
0.4	7.154e+11	2.189e-07	9.603e-05	4.266e-10	1.871e-07
0.5	1.020e+12	2.638e-06	6.237e-04	5.178e-09	1.224e-06
0.6	1.144e+12	1.581e-05	2.323e-03	3.087e-08	4.534e-06
0.8	2.006e+12	3.492e-04	2.577e-02	6.642e-07	4.903e-05
1.0	8.321e+11	9.356e-04	4.235e-02	1.725e-06	7.807e-05
1.5	7.520e+11	1.932e-02	4.056e-01	3.251e-05	6.824e-04
2.0	6.056e+11	1.095e-01	1.448e+00	1.693e-04	2.240e-03
3.0	6.792e+10	1.284e-01	9.992e-01	1.741e-04	1.356e-03
TOTALS:	1.054e+13	2.585e-01	2.924e+00	3.784e-04	4.411e-03

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

Page : 1
DOS File: 1TB1.MS5
Run Date: June 25, 2008
Run Time: 11:28:26 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 3' Shield - 1 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	3.6551e-006	1.3524e+005	3.2270e-011	1.1940e-006
Ba-137m	6.8533e+000	2.5357e+011	6.0506e-005	2.2387e+000
Ba-139	1.6979e+000	6.2821e+010	1.4990e-005	5.5463e-001
Ba-140	2.8124e+000	1.0406e+011	2.4830e-005	9.1871e-001
Ce-141	6.4664e-002	2.3926e+009	5.7090e-007	2.1123e-002
Ce-143	5.8785e-002	2.1751e+009	5.1900e-007	1.9203e-002
Ce-144	5.4379e-002	2.0120e+009	4.8010e-007	1.7764e-002
Cm-242	9.5699e-004	3.5409e+007	8.4490e-009	3.1261e-004
Cm-244	5.6089e-005	2.0753e+006	4.9520e-010	1.8322e-005
Co-58	1.0655e-003	3.9423e+007	9.4070e-009	3.4806e-004
Co-60	5.7358e-004	2.1222e+007	5.0640e-009	1.8737e-004
Cs-134	9.6254e+000	3.5614e+011	8.4980e-005	3.1443e+000
Cs-136	3.0673e+000	1.1349e+011	2.7080e-005	1.0020e+000
Cs-137	7.2445e+000	2.6805e+011	6.3960e-005	2.3665e+000
I-131	4.8954e+001	1.8113e+012	4.3220e-004	1.5991e+001
I-132	6.0122e+001	2.2245e+012	5.3080e-004	1.9640e+001
I-133	9.8780e+001	3.6548e+012	8.7210e-004	3.2268e+001
I-134	5.1106e+001	1.8909e+012	4.5120e-004	1.6694e+001
I-135	8.7283e+001	3.2295e+012	7.7060e-004	2.8512e+001
Kr-85	2.8702e+000	1.0620e+011	2.5340e-005	9.3758e-001
Kr-85m	4.4548e+001	1.6483e+012	3.9330e-004	1.4552e+001
Kr-87	6.0303e+001	2.2312e+012	5.3240e-004	1.9699e+001
Kr-88	1.1338e+002	4.1950e+012	1.0010e-003	3.7037e+001
La-140	4.8036e-002	1.7773e+009	4.2410e-007	1.5692e-002
La-141	2.1441e-002	7.9333e+008	1.8930e-007	7.0041e-003

For Information Only
DOS File: 1TB1.MS5
Run Date: June 25, 2008
Run Time: 11:28:26 AM
Duration: 00:00:12

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	1.5982e-002	5.9133e+008	1.4110e-007	5.2207e-003
Mo-99	3.5951e-001	1.3302e+010	3.1740e-006	1.1744e-001
Nb-95	2.7614e-002	1.0217e+009	2.4380e-007	9.0206e-003
Nd-147	1.0414e-002	3.8531e+008	9.1940e-008	3.4018e-003
Np-239	7.5356e-001	2.7882e+010	6.6530e-006	2.4616e-001
Pr-143	2.3174e-002	8.5745e+008	2.0460e-007	7.5702e-003
Pr-144	5.3602e-002	1.9833e+009	4.7323e-007	1.7510e-002
Pu-238	1.6390e-004	6.0642e+006	1.4470e-009	5.3539e-005
Pu-239	1.7409e-005	6.4413e+005	1.5370e-010	5.6869e-006
Pu-240	2.7988e-005	1.0356e+006	2.4710e-010	9.1427e-006
Pu-241	6.9024e-003	2.5539e+008	6.0940e-008	2.2548e-003
Rb-86	9.0738e-002	3.3573e+009	8.0110e-007	2.9641e-002
Rh-103m	3.0863e-001	1.1419e+010	2.7248e-006	1.0082e-001
Rh-105	1.9935e-001	7.3759e+009	1.7600e-006	6.5120e-002
Rh-106	1.2323e-001	4.5596e+009	1.0880e-006	4.0256e-002
Ru-103	3.0944e-001	1.1449e+010	2.7320e-006	1.0108e-001
Ru-105	1.8304e-001	6.7724e+009	1.6160e-006	5.9792e-002
Ru-106	1.2323e-001	4.5596e+009	1.0880e-006	4.0256e-002
Sb-127	3.3538e-001	1.2409e+010	2.9610e-006	1.0956e-001
Sb-129	1.0635e+000	3.9348e+010	9.3890e-006	3.4739e-001
Sr-89	1.4781e+000	5.4691e+010	1.3050e-005	4.8285e-001
Sr-90	1.8848e-001	6.9736e+009	1.6640e-006	6.1568e-002
Sr-91	1.7522e+000	6.4832e+010	1.5470e-005	5.7239e-001
Sr-92	1.5495e+000	5.7331e+010	1.3680e-005	5.0616e-001
Tc-99m	3.2168e-001	1.1902e+010	2.8400e-006	1.0508e-001
Te-127	3.3482e-001	1.2388e+010	2.9560e-006	1.0937e-001
Te-127m	5.7143e-002	2.1143e+009	5.0450e-007	1.8667e-002
Te-129	1.1309e+000	4.1841e+010	9.9840e-006	3.6941e-001
Te-129m	2.3933e-001	8.8553e+009	2.1130e-006	7.8181e-002
Te-131m	7.5526e-001	2.7945e+010	6.6680e-006	2.4672e-001
Te-132	5.4911e+000	2.0317e+011	4.8480e-005	1.7938e+000
Xe-133	4.1025e+002	1.5179e+013	3.6220e-003	1.3401e+002
Xe-135	1.3818e+002	5.1128e+012	1.2200e-003	4.5140e+001
Y-90	2.7139e-003	1.0041e+008	2.3960e-008	8.8652e-004
Y-91	1.9391e-002	7.1747e+008	1.7120e-007	6.3344e-003
Y-92	1.3547e-001	5.0123e+009	1.1960e-006	4.4252e-002
Y-93	1.4351e-002	5.3098e+008	1.2670e-007	4.6879e-003
Zr-95	2.7603e-002	1.0213e+009	2.4370e-007	9.0169e-003
Zr-97	2.6221e-002	9.7018e+008	2.3150e-007	8.5655e-003

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.329e+06	0.000e+00	3.171e-30	0.000e+00	2.720e-31

DOS File: 1TB1.MS5
Run Date: June 25, 2008
Run Time: 11:28:26 AM
Duration: 00:00:12

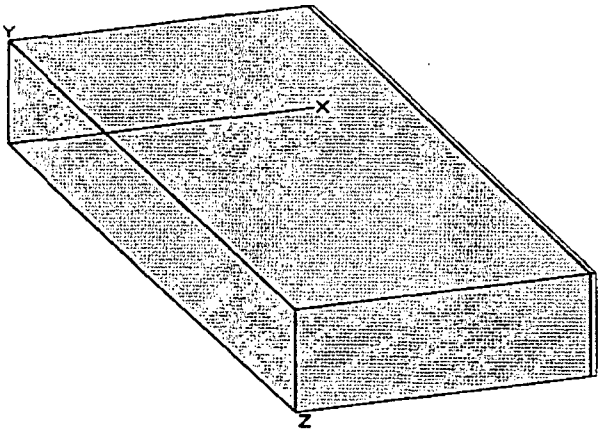
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.334e+09	0.000e+00	1.581e-26	0.000e+00	5.475e-28
0.03	7.981e+12	2.032e-106	1.025e-21	2.014e-108	1.015e-23
0.04	1.083e+10	3.442e-55	1.227e-23	1.522e-57	5.428e-26
0.05	2.671e+10	1.750e-35	2.748e-22	4.661e-38	7.321e-25
0.06	1.490e+10	4.327e-27	7.618e-22	8.594e-30	1.513e-24
0.08	5.627e+12	2.758e-17	4.336e-13	4.365e-20	6.862e-16
0.1	3.917e+10	1.765e-16	2.366e-12	2.700e-19	3.619e-15
0.15	1.534e+12	9.067e-12	6.478e-08	1.493e-14	1.067e-10
0.2	6.043e+12	1.301e-09	4.376e-06	2.297e-12	7.724e-09
0.3	6.561e+11	1.129e-08	1.158e-05	2.143e-11	2.197e-08
0.4	3.220e+12	9.854e-07	4.322e-04	1.920e-09	8.422e-07
0.5	4.363e+12	1.128e-05	2.667e-03	2.214e-08	5.236e-06
0.6	4.583e+12	6.337e-05	9.309e-03	1.237e-07	1.817e-05
0.8	7.316e+12	1.274e-03	9.401e-02	2.423e-06	1.788e-04
1.0	3.344e+12	3.761e-03	1.702e-01	6.932e-06	3.138e-04
1.5	3.339e+12	8.577e-02	1.801e+00	1.443e-04	3.030e-03
2.0	3.205e+12	5.795e-01	7.667e+00	8.961e-04	1.186e-02
3.0	3.446e+11	6.512e-01	5.070e+00	8.835e-04	6.878e-03
4.0	1.552e+07	1.178e-04	6.691e-04	1.458e-07	8.278e-07
TOTALS:	5.165e+13	1.322e+00	1.481e+01	1.934e-03	2.228e-02

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

Page : 1
DOS File: 1TB2.MS5
Run Date: June 25, 2008
Run Time: 11:28:50 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 3' Shield - 2 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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	uCi/cm³	Bq/cm³
Am-241	2.9630e-005	1.0963e+006	2.6160e-010	9.6792e-006
Ba-137m	2.7848e+001	1.0304e+012	2.4587e-004	9.0970e+000
Ba-139	8.3228e+000	3.0794e+011	7.3480e-005	2.7188e+000
Ba-140	2.2744e+001	8.4152e+011	2.0080e-004	7.4296e+000
Ce-141	5.2386e-001	1.9383e+010	4.6250e-006	1.7113e-001
Ce-143	4.6654e-001	1.7262e+010	4.1190e-006	1.5240e-001
Ce-144	4.4072e-001	1.6307e+010	3.8910e-006	1.4397e-001
Cm-242	7.7542e-003	2.8691e+008	6.8460e-008	2.5330e-003
Cm-244	4.5465e-004	1.6822e+007	4.0140e-009	1.4852e-004
Co-58	8.6320e-003	3.1938e+008	7.6210e-008	2.8198e-003
Co-60	4.6484e-003	1.7199e+008	4.1040e-008	1.5185e-003
Cs-134	3.9100e+001	1.4467e+012	3.4520e-004	1.2772e+001
Cs-136	1.2437e+001	4.6016e+011	1.0980e-004	4.0626e+000
Cs-137	2.9438e+001	1.0892e+012	2.5990e-004	9.6163e+000
I-131	2.1475e+002	7.9459e+012	1.8960e-003	7.0152e+001
I-132	2.3231e+002	8.5954e+012	2.0510e-003	7.5887e+001
I-133	4.2067e+002	1.5565e+013	3.7140e-003	1.3742e+002
I-134	1.0205e+002	3.7760e+012	9.0100e-004	3.3337e+001
I-135	3.4603e+002	1.2803e+013	3.0550e-003	1.1304e+002
Kr-85	1.7194e+001	6.3617e+011	1.5180e-004	5.6166e+000
Kr-85m	2.2868e+002	8.4613e+012	2.0190e-003	7.4703e+001
Kr-87	2.0943e+002	7.7489e+012	1.8490e-003	6.8413e+001
Kr-88	5.3201e+002	1.9684e+013	4.6970e-003	1.7379e+002
La-140	6.3667e-001	2.3557e+010	5.6210e-006	2.0798e-001
La-141	1.4566e-001	5.3894e+009	1.2860e-006	4.7582e-002

DOS File: 1TB2.MS5
Run Date: June 25, 2008
Run Time: 11:28:50 AM
Duration: 00:00:12

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	8.2639e-002	3.0576e+009	7.2960e-007	2.6995e-002
Mo-99	2.8826e+000	1.0666e+011	2.5450e-005	9.4165e-001
Nb-95	2.2381e-001	8.2811e+009	1.9760e-006	7.3112e-002
Nd-147	8.4180e-002	3.1146e+009	7.4320e-007	2.7498e-002
Np-239	6.0326e+000	2.2320e+011	5.3260e-005	1.9706e+000
Pr-143	1.8825e-001	6.9652e+009	1.6620e-006	6.1494e-002
Pr-144	4.3442e-001	1.6073e+010	3.8354e-006	1.4191e-001
Pu-238	1.3286e-003	4.9159e+007	1.1730e-008	4.3401e-004
Pu-239	1.4113e-004	5.2218e+006	1.2460e-009	4.6102e-005
Pu-240	2.2687e-004	8.3943e+006	2.0030e-009	7.4111e-005
Pu-241	5.5942e-002	2.0699e+009	4.9390e-007	1.8274e-002
Rb-86	3.6823e-001	1.3624e+010	3.2510e-006	1.2029e-001
Rh-103m	2.4989e+000	9.2458e+010	2.2062e-005	8.1629e-001
Rh-105	1.6106e+000	5.9594e+010	1.4220e-005	5.2614e-001
Rh-106	9.9890e-001	3.6959e+010	8.8190e-006	3.2630e-001
Ru-103	2.5055e+000	9.2702e+010	2.2120e-005	8.1844e-001
Ru-105	1.2686e+000	4.6938e+010	1.1200e-005	4.1440e-001
Ru-106	9.9890e-001	3.6959e+010	8.8190e-006	3.2630e-001
Sb-127	2.6980e+000	9.9826e+010	2.3820e-005	8.8134e-001
Sb-129	7.3419e+000	2.7165e+011	6.4820e-005	2.3983e+000
Sr-89	1.1972e+001	4.4297e+011	1.0570e-004	3.9109e+000
Sr-90	1.5280e+000	5.6535e+010	1.3490e-005	4.9913e-001
Sr-91	1.3207e+001	4.8865e+011	1.1660e-004	4.3142e+000
Sr-92	9.7250e+000	3.5983e+011	8.5860e-005	3.1768e+000
Tc-99m	2.6029e+000	9.6306e+010	2.2980e-005	8.5026e-001
Te-127	2.7116e+000	1.0033e+011	2.3940e-005	8.8578e-001
Te-127m	4.6315e-001	1.7136e+010	4.0890e-006	1.5129e-001
Te-129	8.4463e+000	3.1251e+011	7.4570e-005	2.7591e+000
Te-129m	1.9391e+000	7.1747e+010	1.7120e-005	6.3344e-001
Te-131m	5.9816e+000	2.2132e+011	5.2810e-005	1.9540e+000
Te-132	4.4106e+001	1.6319e+012	3.8940e-004	1.4408e+001
Xe-133	2.4488e+003	9.0606e+013	2.1620e-002	7.9994e+002
Xe-135	8.1892e+002	3.0300e+013	7.2300e-003	2.6751e+002
Y-90	3.2507e-002	1.2028e+009	2.8700e-007	1.0619e-002
Y-91	1.5891e-001	5.8798e+009	1.4030e-006	5.1911e-002
Y-92	2.1690e+000	8.0255e+010	1.9150e-005	7.0855e-001
Y-93	1.0861e-001	4.0186e+009	9.5890e-007	3.5479e-002
Zr-95	2.2359e-001	8.2727e+009	1.9740e-006	7.3038e-002
Zr-97	2.0399e-001	7.5477e+009	1.8010e-006	6.6637e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.051e+07	0.000e+00	2.507e-29	0.000e+00	2.151e-30

For Information Only
DOS File: 1TB2.MS5
Run Date: June 25, 2008
Run Time: 11:28:50 AM
Duration: 00:00:12

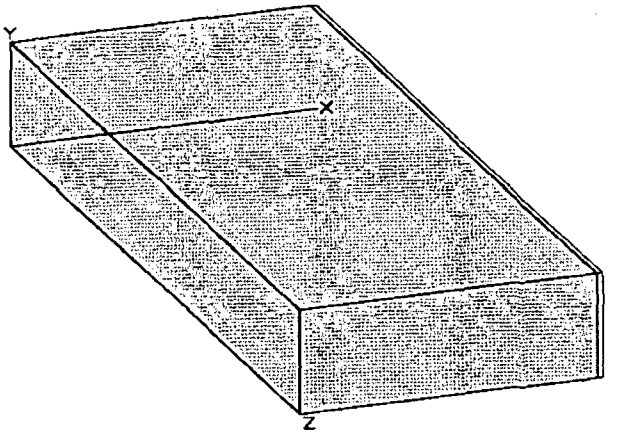
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.882e+10	0.000e+00	1.274e-25	0.000e+00	4.414e-27
0.03	4.746e+13	1.208e-105	6.093e-21	1.198e-107	6.038e-23
0.04	5.469e+10	1.739e-54	6.199e-23	7.689e-57	2.742e-25
0.05	2.145e+11	1.405e-34	2.208e-21	3.744e-37	5.881e-24
0.06	6.336e+10	1.840e-26	3.240e-21	3.655e-29	6.436e-24
0.08	3.350e+13	1.642e-16	2.582e-12	2.599e-19	4.085e-15
0.1	2.842e+11	1.281e-15	1.716e-11	1.959e-18	2.626e-14
0.15	7.583e+12	4.482e-11	3.202e-07	7.380e-14	5.273e-10
0.2	3.447e+13	7.423e-09	2.496e-05	1.310e-11	4.405e-08
0.3	3.000e+12	5.164e-08	5.295e-05	9.796e-11	1.004e-07
0.4	1.257e+13	3.847e-06	1.687e-03	7.495e-09	3.288e-06
0.5	1.796e+13	4.644e-05	1.098e-02	9.115e-08	2.155e-05
0.6	1.715e+13	2.372e-04	3.484e-02	4.629e-07	6.800e-05
0.8	2.301e+13	4.006e-03	2.957e-01	7.620e-06	5.624e-04
1.0	1.222e+13	1.374e-02	6.220e-01	2.533e-05	1.146e-03
1.5	1.338e+13	3.437e-01	7.216e+00	5.783e-04	1.214e-02
2.0	1.423e+13	2.573e+00	3.404e+01	3.978e-03	5.263e-02
3.0	1.237e+12	2.338e+00	1.820e+01	3.172e-03	2.469e-02
4.0	8.026e+07	6.092e-04	3.460e-03	7.536e-07	4.280e-06
TOTALS:	2.384e+14	5.273e+00	6.042e+01	7.763e-03	9.127e-02

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

Page : 1
DOS File: 1TB4.MS5
Run Date: June 25, 2008
Run Time: 11:29:27 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 3' Shield - 4 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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	uCi/cm³	Bq/cm³
Am-241	5.9975e-005	2.2191e+006	5.2950e-010	1.9591e-005
Ba-137m	5.0393e+001	1.8645e+012	4.4490e-004	1.6461e+001
Ba-139	6.1572e+000	2.2781e+011	5.4360e-005	2.0113e+000
Ba-140	4.5794e+001	1.6944e+012	4.0430e-004	1.4959e+001
Ce-141	1.0581e+000	3.9151e+010	9.3420e-006	3.4565e-001
Ce-143	9.0488e-001	3.3481e+010	7.9890e-006	2.9559e-001
Ce-144	8.9107e-001	3.2969e+010	7.8670e-006	2.9108e-001
Cm-242	1.5676e-002	5.8001e+008	1.3840e-007	5.1208e-003
Cm-244	9.1950e-004	3.4021e+007	8.1180e-009	3.0037e-004
Co-58	1.7443e-002	6.4539e+008	1.5400e-007	5.6980e-003
Co-60	9.4011e-003	3.4784e+008	8.3000e-008	3.0710e-003
Cs-134	7.0757e+001	2.6180e+012	6.2470e-004	2.3114e+001
Cs-136	2.2393e+001	8.2853e+011	1.9770e-004	7.3149e+000
Cs-137	5.3269e+001	1.9710e+012	4.7030e-004	1.7401e+001
I-131	4.1150e+002	1.5225e+013	3.6330e-003	1.3442e+002
I-132	2.9936e+002	1.1076e+013	2.6430e-003	9.7791e+001
I-133	7.5900e+002	2.8083e+013	6.7010e-003	2.4794e+002
I-134	4.0493e+001	1.4982e+012	3.5750e-004	1.3227e+001
I-135	5.4119e+002	2.0024e+013	4.7780e-003	1.7679e+002
Kr-85	6.8084e+001	2.5191e+012	6.0110e-004	2.2241e+001
Kr-85m	6.6442e+002	2.4584e+013	5.8660e-003	2.1704e+002
Kr-87	2.7886e+002	1.0318e+013	2.4620e-003	9.1094e+001
Kr-88	1.2924e+003	4.7818e+013	1.1410e-002	4.2217e+002
La-140	2.6878e+000	9.9449e+010	2.3730e-005	8.7801e-001
La-141	2.0716e-001	7.6651e+009	1.8290e-006	6.7673e-002

DOS File: 1TB4.MS5
Run Date: June 25, 2008
Run Time: 11:29:27 AM
Duration: 00:00:12

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	6.8005e-002	2.5162e+009	6.0040e-007	2.2215e-002
Mo-99	5.7098e+000	2.1126e+011	5.0410e-005	1.8652e+000
Nb-95	4.5261e-001	1.6747e+010	3.9960e-006	1.4785e-001
Nd-147	1.6933e-001	6.2653e+009	1.4950e-006	5.5315e-002
Np-239	1.1904e+001	4.4046e+011	1.0510e-004	3.8887e+000
Pr-143	3.8284e-001	1.4165e+010	3.3800e-006	1.2506e-001
Pr-144	8.7832e-001	3.2498e+010	7.7545e-006	2.8692e-001
Pu-238	2.6867e-003	9.9407e+007	2.3720e-008	8.7764e-004
Pu-239	2.8543e-004	1.0561e+007	2.5200e-009	9.3240e-005
Pu-240	4.5884e-004	1.6977e+007	4.0510e-009	1.4989e-004
Pu-241	1.1316e-001	4.1871e+009	9.9910e-007	3.6967e-002
Rb-86	6.6555e-001	2.4625e+010	5.8760e-006	2.1741e-001
Rh-103m	5.0474e+000	1.8675e+011	4.4562e-005	1.6488e+000
Rh-105	3.2179e+000	1.1906e+011	2.8410e-005	1.0512e+000
Rh-106	2.0195e+000	7.4723e+010	1.7830e-005	6.5971e-001
Ru-103	5.0607e+000	1.8725e+011	4.4680e-005	1.6532e+000
Ru-105	1.8780e+000	6.9484e+010	1.6580e-005	6.1346e-001
Ru-106	2.0195e+000	7.4723e+010	1.7830e-005	6.5971e-001
Sb-127	5.3756e+000	1.9890e+011	4.7460e-005	1.7560e+000
Sb-129	1.0773e+001	3.9859e+011	9.5110e-005	3.5191e+000
Sr-89	2.4194e+001	8.9517e+011	2.1360e-004	7.9032e+000
Sr-90	3.0899e+000	1.1433e+011	2.7280e-005	1.0094e+000
Sr-91	2.3084e+001	8.5410e+011	2.0380e-004	7.5406e+000
Sr-92	1.1791e+001	4.3627e+011	1.0410e-004	3.8517e+000
Tc-99m	5.2318e+000	1.9358e+011	4.6190e-005	1.7090e+000
Te-127	5.4708e+000	2.0242e+011	4.8300e-005	1.7871e+000
Te-127m	9.3671e-001	3.4658e+010	8.2700e-006	3.0599e-001
Te-129	1.3807e+001	5.1086e+011	1.2190e-004	4.5103e+000
Te-129m	3.9201e+000	1.4505e+011	3.4610e-005	1.2806e+000
Te-131m	1.1553e+001	4.2747e+011	1.0200e-004	3.7740e+000
Te-132	8.7645e+001	3.2429e+012	7.7380e-004	2.8631e+001
Xe-133	9.6050e+003	3.5538e+014	8.4800e-002	3.1376e+003
Xe-135	2.8917e+003	1.0699e+014	2.5530e-002	9.4461e+002
Y-90	1.2584e-001	4.6560e+009	1.1110e-006	4.1107e-002
Y-91	3.3051e-001	1.2229e+010	2.9180e-006	1.0797e-001
Y-92	7.5164e+000	2.7810e+011	6.6360e-005	2.4553e+000
Y-93	1.9153e-001	7.0867e+009	1.6910e-006	6.2567e-002
Zr-95	4.5182e-001	1.6717e+010	3.9890e-006	1.4759e-001
Zr-97	3.8012e-001	1.4065e+010	3.3560e-006	1.2417e-001

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.028e+07	0.000e+00	4.840e-29	0.000e+00	4.151e-30

DOS File: 1TB4.MS5
Run Date: June 25, 2008
Run Time: 11:29:27 AM
Duration: 00:00:12

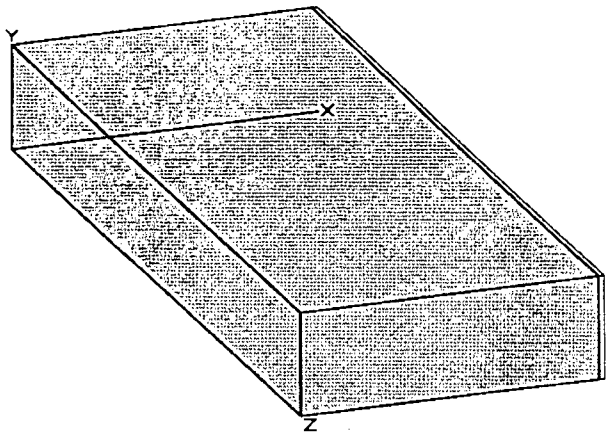
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.765e+10	0.000e+00	2.550e-25	0.000e+00	8.832e-27
0.03	1.807e+14	4.602e-105	2.320e-20	4.561e-107	2.299e-22
0.04	1.004e+11	3.192e-54	1.138e-22	1.412e-56	5.033e-25
0.05	4.263e+11	2.793e-34	4.387e-21	7.440e-37	1.169e-23
0.06	1.151e+11	3.343e-26	5.885e-21	6.640e-29	1.169e-23
0.08	1.309e+14	6.417e-16	1.009e-11	1.015e-18	1.596e-14
0.1	5.779e+11	2.604e-15	3.491e-11	3.984e-18	5.340e-14
0.15	2.097e+13	1.239e-10	8.854e-07	2.041e-13	1.458e-09
0.2	1.126e+14	2.426e-08	8.157e-05	4.281e-11	1.440e-07
0.3	6.579e+12	1.133e-07	1.161e-04	2.149e-10	2.203e-07
0.4	2.133e+13	6.529e-06	2.864e-03	1.272e-08	5.580e-06
0.5	3.059e+13	7.909e-05	1.870e-02	1.552e-07	3.670e-05
0.6	2.512e+13	3.474e-04	5.103e-02	6.780e-07	9.960e-05
0.8	2.922e+13	5.087e-03	3.755e-01	9.677e-06	7.142e-04
1.0	1.831e+13	2.059e-02	9.321e-01	3.796e-05	1.718e-03
1.5	2.292e+13	5.888e-01	1.236e+01	9.907e-04	2.080e-02
2.0	3.212e+13	5.808e+00	7.684e+01	8.981e-03	1.188e-01
3.0	1.816e+12	3.432e+00	2.672e+01	4.656e-03	3.625e-02
4.0	6.605e+07	5.013e-04	2.847e-03	6.202e-07	3.522e-06
TOTALS:	6.345e+14	9.855e+00	1.173e+02	1.468e-02	1.784e-01

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

Page : 1
DOS File: 1TB8.MS5
Run Date: June 25, 2008
Run Time: 11:30:15 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 3' Shield - 8 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	6.4720e-005	2.3947e+006	5.7140e-010	2.1142e-005
Ba-137m	5.4057e+001	2.0001e+012	4.7726e-004	1.7659e+001
Ba-139	8.8755e-001	3.2840e+010	7.8360e-006	2.8993e-001
Ba-140	4.8897e+001	1.8092e+012	4.3170e-004	1.5973e+001
Ce-141	1.1372e+000	4.2076e+010	1.0040e-005	3.7148e-001
Ce-143	8.9650e-001	3.3171e+010	7.9150e-006	2.9286e-001
Ce-144	9.5982e-001	3.5513e+010	8.4740e-006	3.1354e-001
Cm-242	1.6888e-002	6.2486e+008	1.4910e-007	5.5167e-003
Cm-244	9.9074e-004	3.6657e+007	8.7470e-009	3.2364e-004
Co-58	1.8768e-002	6.9442e+008	1.6570e-007	6.1309e-003
Co-60	1.0129e-002	3.7479e+008	8.9430e-008	3.3089e-003
Cs-134	7.5900e+001	2.8083e+012	6.7010e-004	2.4794e+001
Cs-136	2.3820e+001	8.8134e+011	2.1030e-004	7.7811e+000
Cs-137	5.7143e+001	2.1143e+012	5.0450e-004	1.8667e+001
I-131	4.9418e+002	1.8285e+013	4.3630e-003	1.6143e+002
I-132	1.7602e+002	6.5126e+012	1.5540e-003	5.7498e+001
I-133	8.0917e+002	2.9939e+013	7.1440e-003	2.6433e+002
I-134	2.0875e+000	7.7237e+010	1.8430e-005	6.8191e-001
I-135	4.3336e+002	1.6034e+013	3.8260e-003	1.4156e+002
Kr-85	2.2653e+002	8.3817e+012	2.0000e-003	7.4000e+001
Kr-85m	1.1904e+003	4.4046e+013	1.0510e-002	3.8887e+002
Kr-87	1.0483e+002	3.8786e+012	9.2550e-004	3.4244e+001
Kr-88	1.6197e+003	5.9929e+013	1.4300e-002	5.2910e+002
La-140	5.9669e+000	2.2077e+011	5.2680e-005	1.9492e+000
La-141	1.1021e-001	4.0777e+009	9.7300e-007	3.6001e-002

DOS File: 1TB8.MS5
Run Date: June 25, 2008
Run Time: 11:30:15 AM
Duration: 00:00:12

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	1.2131e-002	4.4884e+008	1.0710e-007	3.9627e-003
Mo-99	5.9000e+000	2.1830e+011	5.2090e-005	1.9273e+000
Nb-95	4.8772e-001	1.8046e+010	4.3060e-006	1.5932e-001
Nd-147	1.8055e-001	6.6802e+009	1.5940e-006	5.8978e-002
Np-239	1.2210e+001	4.5177e+011	1.0780e-004	3.9886e+000
Pr-143	4.1693e-001	1.5427e+010	3.6810e-006	1.3620e-001
Pr-144	9.4609e-001	3.5005e+010	8.3528e-006	3.0905e-001
Pu-238	2.8951e-003	1.0712e+008	2.5560e-008	9.4572e-004
Pu-239	3.0774e-004	1.1387e+007	2.7170e-009	1.0053e-004
Pu-240	4.9441e-004	1.8293e+007	4.3650e-009	1.6151e-004
Pu-241	1.2187e-001	4.5094e+009	1.0760e-006	3.9812e-002
Rb-86	7.1675e-001	2.6520e+010	6.3280e-006	2.3414e-001
Rh-103m	5.4225e+000	2.0063e+011	4.7874e-005	1.7713e+000
Rh-105	3.3198e+000	1.2283e+011	2.9310e-005	1.0845e+000
Rh-106	2.1758e+000	8.0506e+010	1.9210e-005	7.1077e-001
Ru-103	5.4368e+000	2.0116e+011	4.8000e-005	1.7760e+000
Ru-105	1.0837e+000	4.0098e+010	9.5680e-006	3.5402e-001
Ru-106	2.1758e+000	8.0506e+010	1.9210e-005	7.1077e-001
Sb-127	5.6214e+000	2.0799e+011	4.9630e-005	1.8363e+000
Sb-129	6.1096e+000	2.2605e+011	5.3940e-005	1.9958e+000
Sr-89	2.6006e+001	9.6222e+011	2.2960e-004	8.4952e+000
Sr-90	3.3300e+000	1.2321e+011	2.9400e-005	1.0878e+000
Sr-91	1.8576e+001	6.8730e+011	1.6400e-004	6.0680e+000
Sr-92	4.5680e+000	1.6902e+011	4.0330e-005	1.4922e+000
Tc-99m	5.5217e+000	2.0430e+011	4.8750e-005	1.8037e+000
Te-127	5.8411e+000	2.1612e+011	5.1570e-005	1.9081e+000
Te-127m	1.0093e+000	3.7345e+010	8.9110e-006	3.2971e-001
Te-129	9.4034e+000	3.4792e+011	8.3020e-005	3.0717e+000
Te-129m	4.2169e+000	1.5603e+011	3.7230e-005	1.3775e+000
Te-131m	1.1349e+001	4.1992e+011	1.0020e-004	3.7074e+000
Te-132	9.1157e+001	3.3728e+012	8.0480e-004	2.9778e+001
Xe-133	3.1250e+004	1.1563e+015	2.7590e-001	1.0208e+004
Xe-135	7.0735e+003	2.6172e+014	6.2450e-002	2.3106e+003
Y-90	2.7082e-001	1.0020e+010	2.3910e-006	8.8467e-002
Y-91	3.7321e-001	1.3809e+010	3.2950e-006	1.2192e-001
Y-92	7.7701e+000	2.8749e+011	6.8600e-005	2.5382e+000
Y-93	1.5676e-001	5.8001e+009	1.3840e-006	5.1208e-002
Zr-95	4.8591e-001	1.7979e+010	4.2900e-006	1.5873e-001
Zr-97	3.4761e-001	1.2862e+010	3.0690e-006	1.1355e-001

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.015e+07	0.000e+00	4.808e-29	0.000e+00	4.124e-30

DOS File: 1TB8.MS5
Run Date: June 25, 2008
Run Time: 11:30:15 AM
Duration: 00:00:12

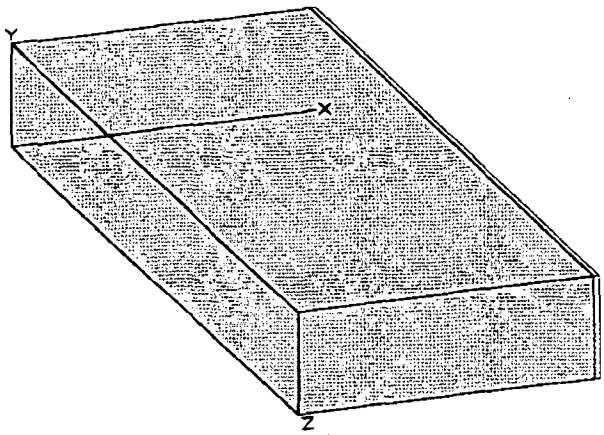
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.969e+10	0.000e+00	2.688e-25	0.000e+00	9.311e-27
0.03	5.732e+14	1.459e-104	7.358e-20	1.446e-106	7.292e-22
0.04	1.047e+11	3.328e-54	1.187e-22	1.472e-56	5.248e-25
0.05	4.434e+11	2.905e-34	4.563e-21	7.738e-37	1.215e-23
0.06	1.219e+11	3.541e-26	6.234e-21	7.033e-29	1.238e-23
0.08	4.249e+14	2.083e-15	3.274e-11	3.296e-18	5.182e-14
0.1	6.143e+11	2.768e-15	3.710e-11	4.235e-18	5.677e-14
0.15	3.641e+13	2.152e-10	1.538e-06	3.544e-13	2.532e-09
0.2	2.555e+14	5.502e-08	1.850e-04	9.710e-11	3.265e-07
0.3	9.329e+12	1.606e-07	1.647e-04	3.047e-10	3.124e-07
0.4	2.140e+13	6.549e-06	2.873e-03	1.276e-08	5.597e-06
0.5	3.083e+13	7.973e-05	1.885e-02	1.565e-07	3.700e-05
0.6	2.405e+13	3.325e-04	4.885e-02	6.491e-07	9.535e-05
0.8	2.363e+13	4.114e-03	3.036e-01	7.824e-06	5.775e-04
1.0	1.560e+13	1.754e-02	7.942e-01	3.234e-05	1.464e-03
1.5	2.160e+13	5.548e-01	1.165e+01	9.334e-04	1.960e-02
2.0	3.857e+13	6.974e+00	9.226e+01	1.078e-02	1.427e-01
3.0	1.013e+12	1.914e+00	1.490e+01	2.597e-03	2.021e-02
4.0	1.178e+07	8.943e-05	5.079e-04	1.106e-07	6.283e-07
TOTALS:	1.477e+15	9.465e+00	1.200e+02	1.436e-02	1.847e-01

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

Page : 1
DOS File: 1TB16.MS5
Run Date: June 25, 2008
Run Time: 11:28:38 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 3' Shield - 16 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	6.5264e-005	2.4148e+006	5.7620e-010	2.1319e-005
Ba-137m	5.4786e+001	2.0271e+012	4.8369e-004	1.7897e+001
Ba-139	1.5971e-002	5.9091e+008	1.4100e-007	5.2170e-003
Ba-140	4.8297e+001	1.7870e+012	4.2640e-004	1.5777e+001
Ce-141	1.1349e+000	4.1992e+010	1.0020e-005	3.7074e-001
Ce-143	7.6217e-001	2.8200e+010	6.7290e-006	2.4897e-001
Ce-144	9.6458e-001	3.5689e+010	8.5160e-006	3.1509e-001
Cm-242	1.6956e-002	6.2737e+008	1.4970e-007	5.5389e-003
Cm-244	9.9640e-004	3.6867e+007	8.7970e-009	3.2549e-004
Co-58	1.8814e-002	6.9610e+008	1.6610e-007	6.1457e-003
Co-60	1.0187e-002	3.7693e+008	8.9940e-008	3.3278e-003
Cs-134	7.6896e+001	2.8452e+012	6.7890e-004	2.5119e+001
Cs-136	2.3718e+001	8.7756e+011	2.0940e-004	7.7478e+000
Cs-137	5.7913e+001	2.1428e+012	5.1130e-004	1.8918e+001
I-131	6.1277e+002	2.2673e+013	5.4100e-003	2.0017e+002
I-132	1.0724e+002	3.9679e+012	9.4680e-004	3.5032e+001
I-133	7.9071e+002	2.9256e+013	6.9810e-003	2.5830e+002
I-134	4.7674e-003	1.7639e+008	4.2090e-008	1.5573e-003
I-135	2.3888e+002	8.8385e+012	2.1090e-003	7.8033e+001
Kr-85	7.6681e+002	2.8372e+013	6.7700e-003	2.5049e+002
Kr-85m	1.1689e+003	4.3250e+013	1.0320e-002	3.8184e+002
Kr-87	4.5318e+000	1.6768e+011	4.0010e-005	1.4804e+000
Kr-88	7.7848e+002	2.8804e+013	6.8730e-003	2.5430e+002
La-140	1.1519e+001	4.2621e+011	1.0170e-004	3.7629e+000
La-141	2.7037e-002	1.0004e+009	2.3870e-007	8.8319e-003

DOS File: 1TB16.MS5
Run Date: June 25, 2008
Run Time: 11:28:38 AM
Duration: 00:00:12

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	3.3448e-004	1.2376e+007	2.9530e-009	1.0926e-004
Mo-99	5.4549e+000	2.0183e+011	4.8160e-005	1.7819e+000
Nb-95	4.9044e-001	1.8146e+010	4.3300e-006	1.6021e-001
Nd-147	1.7783e-001	6.5796e+009	1.5700e-006	5.8090e-002
Np-239	1.1136e+001	4.1204e+011	9.8320e-005	3.6378e+000
Pr-143	4.2622e-001	1.5770e+010	3.7630e-006	1.3923e-001
Pr-144	9.5078e-001	3.5179e+010	8.3942e-006	3.1059e-001
Pu-238	2.9109e-003	1.0770e+008	2.5700e-008	9.5090e-004
Pu-239	3.0978e-004	1.1462e+007	2.7350e-009	1.0119e-004
Pu-240	4.9724e-004	1.8398e+007	4.3900e-009	1.6243e-004
Pu-241	1.2267e-001	4.5387e+009	1.0830e-006	4.0071e-002
Rb-86	7.4314e-001	2.7496e+010	6.5610e-006	2.4276e-001
Rh-103m	5.4214e+000	2.0059e+011	4.7864e-005	1.7710e+000
Rh-105	2.9427e+000	1.0888e+011	2.5980e-005	9.6126e-001
Rh-106	2.1872e+000	8.0925e+010	1.9310e-005	7.1447e-001
Ru-103	5.4356e+000	2.0112e+011	4.7990e-005	1.7756e+000
Ru-105	3.1261e-001	1.1567e+010	2.7600e-006	1.0212e-001
Ru-106	2.1872e+000	8.0925e+010	1.9310e-005	7.1447e-001
Sb-127	5.3235e+000	1.9697e+011	4.7000e-005	1.7390e+000
Sb-129	1.7024e+000	6.2989e+010	1.5030e-005	5.5611e-001
Sr-89	2.6040e+001	9.6348e+011	2.2990e-004	8.5063e+000
Sr-90	3.3493e+000	1.2392e+011	2.9570e-005	1.0941e+000
Sr-91	1.0422e+001	3.8560e+011	9.2010e-005	3.4044e+000
Sr-92	5.9374e-001	2.1968e+010	5.2420e-006	1.9395e-001
Tc-99m	5.3020e+000	1.9617e+011	4.6810e-005	1.7320e+000
Te-127	5.7449e+000	2.1256e+011	5.0720e-005	1.8766e+000
Te-127m	1.0151e+000	3.7558e+010	8.9620e-006	3.3159e-001
Te-129	5.7754e+000	2.1369e+011	5.0990e-005	1.8866e+000
Te-129m	4.2169e+000	1.5603e+011	3.7230e-005	1.3775e+000
Te-131m	9.4883e+000	3.5107e+011	8.3770e-005	3.0995e+000
Te-132	8.5403e+001	3.1599e+012	7.5400e-004	2.7898e+001
Xe-133	1.0119e+005	3.7441e+015	8.9340e-001	3.3056e+004
Xe-135	1.2856e+004	4.7566e+014	1.1350e-001	4.1995e+003
Y-90	5.2839e-001	1.9550e+010	4.6650e-006	1.7261e-001
Y-91	3.9734e-001	1.4702e+010	3.5080e-006	1.2980e-001
Y-92	2.8747e+000	1.0636e+011	2.5380e-005	9.3906e-001
Y-93	9.1077e-002	3.3699e+009	8.0410e-007	2.9752e-002
Zr-95	4.8693e-001	1.8016e+010	4.2990e-006	1.5906e-001
Zr-97	2.5179e-001	9.3163e+009	2.2230e-006	8.2251e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.797e+07	0.000e+00	4.290e-29	0.000e+00	3.679e-30

DOS File: 1TB16.MS5
Run Date: June 25, 2008
Run Time: 11:28:38 AM
Duration: 00:00:12

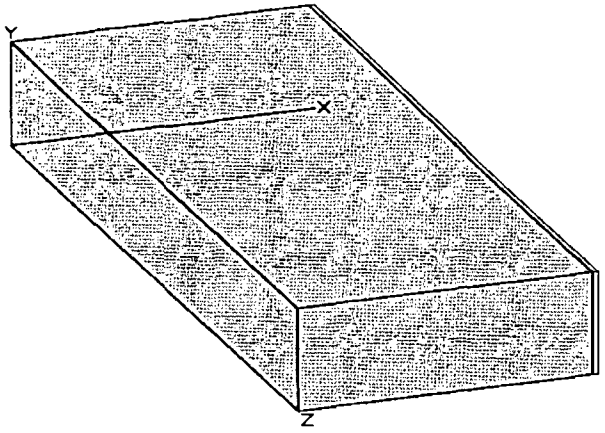
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.836e+10	0.000e+00	2.598e-25	0.000e+00	8.998e-27
0.03	1.825e+15	4.646e-104	2.342e-19	4.604e-106	2.321e-21
0.04	1.021e+11	3.245e-54	1.157e-22	1.435e-56	5.118e-25
0.05	4.155e+11	2.722e-34	4.275e-21	7.250e-37	1.139e-23
0.06	1.202e+11	3.493e-26	6.149e-21	6.937e-29	1.221e-23
0.08	1.375e+15	6.739e-15	1.059e-10	1.067e-17	1.677e-13
0.1	5.103e+11	2.300e-15	3.082e-11	3.518e-18	4.716e-14
0.15	3.543e+13	2.094e-10	1.496e-06	3.449e-13	2.464e-09
0.2	4.411e+14	9.500e-08	3.194e-04	1.677e-10	5.638e-07
0.3	9.100e+12	1.567e-07	1.606e-04	2.972e-10	3.047e-07
0.4	2.296e+13	7.028e-06	3.082e-03	1.369e-08	6.006e-06
0.5	2.898e+13	7.494e-05	1.772e-02	1.471e-07	3.478e-05
0.6	2.752e+13	3.805e-04	5.590e-02	7.428e-07	1.091e-04
0.8	1.559e+13	2.714e-03	2.003e-01	5.162e-06	3.810e-04
1.0	9.104e+12	1.024e-02	4.634e-01	1.887e-05	8.542e-04
1.5	1.171e+13	3.007e-01	6.314e+00	5.060e-04	1.062e-02
2.0	1.864e+13	3.370e+00	4.459e+01	5.212e-03	6.895e-02
3.0	2.609e+11	4.930e-01	3.838e+00	6.689e-04	5.207e-03
4.0	3.249e+05	2.466e-06	1.400e-05	3.050e-09	1.732e-08
TOTALS:	3.821e+15	4.177e+00	5.548e+01	6.412e-03	8.617e-02

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

Page : 1
DOS File: 1TB24.MS5
Run Date: June 25, 2008
Run Time: 11:29:02 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 3' Shield - 24 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	6.5445e-005	2.4215e+006	5.7780e-010	2.1379e-005
Ba-137m	5.5225e+001	2.0433e+012	4.8757e-004	1.8040e+001
Ba-139	2.8588e-004	1.0578e+007	2.5240e-009	9.3388e-005
Ba-140	4.7436e+001	1.7551e+012	4.1880e-004	1.5496e+001
Ce-141	1.1276e+000	4.1720e+010	9.9550e-006	3.6833e-001
Ce-143	6.4426e-001	2.3838e+010	5.6880e-006	2.1046e-001
Ce-144	9.6378e-001	3.5660e+010	8.5090e-006	3.1483e-001
Cm-242	1.6933e-002	6.2653e+008	1.4950e-007	5.5315e-003
Cm-244	9.9640e-004	3.6867e+007	8.7970e-009	3.2549e-004
Co-58	1.8757e-002	6.9401e+008	1.6560e-007	6.1272e-003
Co-60	1.0186e-002	3.7688e+008	8.9930e-008	3.3274e-003
Cs-134	7.7497e+001	2.8674e+012	6.8420e-004	2.5315e+001
Cs-136	2.3491e+001	8.6918e+011	2.0740e-004	7.6738e+000
Cs-137	5.8377e+001	2.1600e+012	5.1540e-004	1.9070e+001
I-131	7.3193e+002	2.7081e+013	6.4620e-003	2.3909e+002
I-132	9.5733e+001	3.5421e+012	8.4520e-004	3.1272e+001
I-133	7.4439e+002	2.7542e+013	6.5720e-003	2.4316e+002
I-134	1.0490e-005	3.8811e+005	9.2610e-011	3.4266e-006
I-135	1.2686e+002	4.6938e+012	1.1200e-003	4.1440e+001
Kr-85	1.5959e+003	5.9049e+013	1.4090e-002	5.2133e+002
Kr-85m	7.0565e+002	2.6109e+013	6.2300e-003	2.3051e+002
Kr-87	1.2052e-001	4.4591e+009	1.0640e-006	3.9368e-002
Kr-88	2.2993e+002	8.5074e+012	2.0300e-003	7.5110e+001
La-140	1.6254e+001	6.0139e+011	1.4350e-004	5.3095e+000
La-141	6.5944e-003	2.4399e+008	5.8220e-008	2.1541e-003

DOS File: 1TB24.MS5
Run Date: June 25, 2008
Run Time: 11:29:02 AM
Duration: 00:00:12

Nuclide	curies	becquerels	uCi/cm³	Bq/cm³
La-142	9.1678e-006	3.3921e+005	8.0940e-011	2.9948e-006
Mo-99	5.0154e+000	1.8557e+011	4.4280e-005	1.6384e+000
Nb-95	4.9033e-001	1.8142e+010	4.3290e-006	1.6017e-001
Nd-147	1.7420e-001	6.4455e+009	1.5380e-006	5.6906e-002
Np-239	1.0095e+001	3.7353e+011	8.9130e-005	3.2978e+000
Pr-143	4.3086e-001	1.5942e+010	3.8040e-006	1.4075e-001
Pr-144	9.5000e-001	3.5150e+010	8.3873e-006	3.1033e-001
Pu-238	2.9121e-003	1.0775e+008	2.5710e-008	9.5127e-004
Pu-239	3.1012e-004	1.1475e+007	2.7380e-009	1.0131e-004
Pu-240	4.9724e-004	1.8398e+007	4.3900e-009	1.6243e-004
Pu-241	1.2267e-001	4.5387e+009	1.0830e-006	4.0071e-002
Rb-86	7.7214e-001	2.8569e+010	6.8170e-006	2.5223e-001
Rh-103m	5.3897e+000	1.9942e+011	4.7585e-005	1.7606e+000
Rh-105	2.5417e+000	9.4043e+010	2.2440e-005	8.3028e-001
Rh-106	2.1860e+000	8.0883e+010	1.9300e-005	7.1410e-001
Ru-103	5.4039e+000	1.9995e+011	4.7710e-005	1.7653e+000
Ru-105	8.9662e-002	3.3175e+009	7.9160e-007	2.9289e-002
Ru-106	2.1860e+000	8.0883e+010	1.9300e-005	7.1410e-001
Sb-127	5.0143e+000	1.8553e+011	4.4270e-005	1.6380e+000
Sb-129	4.7164e-001	1.7451e+010	4.1640e-006	1.5407e-001
Sr-89	2.5915e+001	9.5887e+011	2.2880e-004	8.4656e+000
Sr-90	3.3493e+000	1.2392e+011	2.9570e-005	1.0941e+000
Sr-91	5.8140e+000	2.1512e+011	5.1330e-005	1.8992e+000
Sr-92	7.6727e-002	2.8389e+009	6.7740e-007	2.5064e-002
Tc-99m	5.0268e+000	1.8599e+011	4.4380e-005	1.6421e+000
Te-127	5.5976e+000	2.0711e+011	4.9420e-005	1.8285e+000
Te-127m	1.0149e+000	3.7550e+010	8.9600e-006	3.3152e-001
Te-129	4.2849e+000	1.5854e+011	3.7830e-005	1.3997e+000
Te-129m	4.1897e+000	1.5502e+011	3.6990e-005	1.3686e+000
Te-131m	7.8867e+000	2.9181e+011	6.9630e-005	2.5763e+000
Te-132	7.9558e+001	2.9437e+012	7.0240e-004	2.5989e+001
Xe-133	2.0150e+005	7.4555e+015	1.7790e+000	6.5823e+004
Xe-135	1.4464e+004	5.3517e+014	1.2770e-001	4.7249e+003
Y-90	7.6398e-001	2.8267e+010	6.7450e-006	2.4956e-001
Y-91	4.0878e-001	1.5125e+010	3.6090e-006	1.3353e-001
Y-92	7.7078e-001	2.8519e+010	6.8050e-006	2.5179e-001
Y-93	5.2601e-002	1.9462e+009	4.6440e-007	1.7183e-002
Zr-95	4.8523e-001	1.7954e+010	4.2840e-006	1.5851e-001
Zr-97	1.8134e-001	6.7096e+009	1.6010e-006	5.9237e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.665e+07	0.000e+00	3.973e-29	0.000e+00	3.408e-30

DOS File: 1TB24.MS5
Run Date: June 25, 2008
Run Time: 11:29:02 AM
Duration: 00:00:12

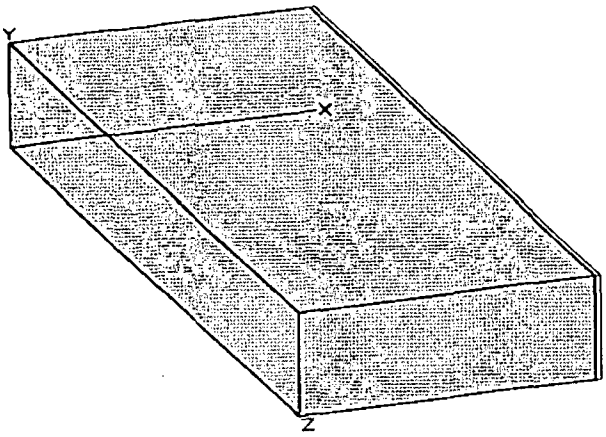
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.690e+10	0.000e+00	2.499e-25	0.000e+00	8.656e-27
0.03	3.608e+15	9.185e-104	4.631e-19	9.103e-106	4.590e-21
0.04	9.956e+10	3.164e-54	1.128e-22	1.400e-56	4.990e-25
0.05	3.871e+11	2.536e-34	3.983e-21	6.755e-37	1.061e-23
0.06	1.181e+11	3.430e-26	6.039e-21	6.813e-29	1.200e-23
0.08	2.737e+15	1.342e-14	2.109e-10	2.123e-17	3.338e-13
0.1	4.296e+11	1.936e-15	2.595e-11	2.962e-18	3.970e-14
0.15	2.200e+13	1.300e-10	9.291e-07	2.142e-13	1.530e-09
0.2	4.917e+14	1.059e-07	3.560e-04	1.869e-10	6.284e-07
0.3	6.772e+12	1.166e-07	1.195e-04	2.211e-10	2.267e-07
0.4	2.596e+13	7.943e-06	3.484e-03	1.548e-08	6.789e-06
0.5	2.710e+13	7.008e-05	1.657e-02	1.376e-07	3.252e-05
0.6	2.905e+13	4.016e-04	5.900e-02	7.839e-07	1.152e-04
0.8	1.180e+13	2.054e-03	1.516e-01	3.907e-06	2.884e-04
1.0	5.515e+12	6.202e-03	2.807e-01	1.143e-05	5.175e-04
1.5	5.938e+12	1.525e-01	3.202e+00	2.566e-04	5.388e-03
2.0	5.823e+12	1.053e+00	1.393e+01	1.628e-03	2.154e-02
3.0	8.768e+10	1.657e-01	1.290e+00	2.248e-04	1.750e-03
4.0	8.904e+03	6.758e-08	3.838e-07	8.361e-11	4.748e-10
TOTALS:	6.977e+15	1.380e+00	1.893e+01	2.126e-03	2.964e-02

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

Page : 1
DOS File: 1TB48.MS5
Run Date: June 25, 2008
Run Time: 11:29:39 AM
Duration: 00:00:12

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

Case Title: TB Dose
Description: 3' Shield - 48 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	6.5978e-005	2.4412e+006	5.8250e-010	2.1553e-005
Ba-137m	5.5847e+001	2.0663e+012	4.9306e-004	1.8243e+001
Ba-139	1.6390e-009	6.0642e+001	1.4470e-014	5.3539e-010
Ba-140	4.4910e+001	1.6617e+012	3.9650e-004	1.4671e+001
Ce-141	1.1037e+000	4.0836e+010	9.7440e-006	3.6053e-001
Ce-143	3.8907e-001	1.4396e+010	3.4350e-006	1.2710e-001
Ce-144	9.6129e-001	3.5568e+010	8.4870e-006	3.1402e-001
Cm-242	1.6854e-002	6.2360e+008	1.4880e-007	5.5056e-003
Cm-244	9.9618e-004	3.6859e+007	8.7950e-009	3.2542e-004
Co-58	1.8564e-002	6.8688e+008	1.6390e-007	6.0643e-003
Co-60	1.0180e-002	3.7667e+008	8.9880e-008	3.3256e-003
Cs-134	7.8312e+001	2.8976e+012	6.9140e-004	2.5582e+001
Cs-136	2.2540e+001	8.3398e+011	1.9900e-004	7.3630e+000
Cs-137	5.9034e+001	2.1843e+012	5.2120e-004	1.9284e+001
I-131	8.7498e+002	3.2374e+013	7.7250e-003	2.8583e+002
I-132	7.6749e+001	2.8397e+012	6.7760e-004	2.5071e+001
I-133	4.3585e+002	1.6126e+013	3.8480e-003	1.4238e+002
I-134				
I-135	1.3343e+001	4.9368e+011	1.1780e-004	4.3586e+000
Kr-85	3.3595e+003	1.2430e+014	2.9660e-002	1.0974e+003
Kr-85m	3.6234e+001	1.3407e+012	3.1990e-004	1.1836e+001
Kr-87	5.2827e-007	1.9546e+004	4.6640e-012	1.7257e-007
Kr-88	1.3830e+000	5.1170e+010	1.2210e-005	4.5177e-001
La-140	2.6470e+001	9.7940e+011	2.3370e-004	8.6469e+000
La-141	9.5665e-005	3.5396e+006	8.4460e-010	3.1250e-005

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142	1.8870e-010	6.9820e+000	1.6660e-015	6.1642e-011
Mo-99	3.8975e+000	1.4421e+011	3.4410e-005	1.2732e+000
Nb-95	4.9010e-001	1.8134e+010	4.3270e-006	1.6010e-001
Nd-147	1.6344e-001	6.0474e+009	1.4430e-006	5.3391e-002
Np-239	7.5209e+000	2.7827e+011	6.6400e-005	2.4568e+000
Pr-143	4.3460e-001	1.6080e+010	3.8370e-006	1.4197e-001
Pr-144	9.4754e-001	3.5059e+010	8.3656e-006	3.0953e-001
Pu-238	2.9109e-003	1.0770e+008	2.5700e-008	9.5090e-004
Pu-239	3.1069e-004	1.1496e+007	2.7430e-009	1.0149e-004
Pu-240	4.9713e-004	1.8394e+007	4.3890e-009	1.6239e-004
Pu-241	1.2255e-001	4.5345e+009	1.0820e-006	4.0034e-002
Rb-86	8.0294e-001	2.9709e+010	7.0890e-006	2.6229e-001
Rh-103m	5.2948e+000	1.9591e+011	4.6747e-005	1.7296e+000
Rh-105	1.5959e+000	5.9049e+010	1.4090e-005	5.2133e-001
Rh-106	2.1815e+000	8.0716e+010	1.9260e-005	7.1262e-001
Ru-103	5.3088e+000	1.9643e+011	4.6870e-005	1.7342e+000
Ru-105	2.1147e-003	7.8243e+007	1.8670e-008	6.9079e-004
Ru-106	2.1815e+000	8.0716e+010	1.9260e-005	7.1262e-001
Sb-127	4.1875e+000	1.5494e+011	3.6970e-005	1.3679e+000
Sb-129	1.0027e-002	3.7102e+008	8.8530e-008	3.2756e-003
Sr-89	2.5564e+001	9.4588e+011	2.2570e-004	8.3509e+000
Sr-90	3.3482e+000	1.2388e+011	2.9560e-005	1.0937e+000
Sr-91	1.0090e+000	3.7332e+010	8.9080e-006	3.2960e-001
Sr-92	1.6560e-004	6.1270e+006	1.4620e-009	5.4094e-005
Tc-99m	3.9892e+000	1.4760e+011	3.5220e-005	1.3031e+000
Te-127	4.9645e+000	1.8369e+011	4.3830e-005	1.6217e+000
Te-127m	1.0136e+000	3.7504e+010	8.9490e-006	3.3111e-001
Te-129	3.5622e+000	1.3180e+011	3.1450e-005	1.1637e+000
Te-129m	4.1036e+000	1.5183e+011	3.6230e-005	1.3405e+000
Te-131m	4.5295e+000	1.6759e+011	3.9990e-005	1.4796e+000
Te-132	6.4301e+001	2.3791e+012	5.6770e-004	2.1005e+001
Xe-133	3.7174e+005	1.3754e+016	3.2820e+000	1.2143e+005
Xe-135	4.9067e+003	1.8155e+014	4.3320e-002	1.6028e+003
Y-90	1.3592e+000	5.0290e+010	1.2000e-005	4.4400e-001
Y-91	4.1750e-001	1.5447e+010	3.6860e-006	1.3638e-001
Y-92	8.9378e-003	3.3070e+008	7.8910e-008	2.9197e-003
Y-93	1.0129e-002	3.7479e+008	8.9430e-008	3.3089e-003
Zr-95	4.7991e-001	1.7757e+010	4.2370e-006	1.5677e-001
Zr-97	6.7767e-002	2.5074e+009	5.9830e-007	2.2137e-002

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.518e+07	0.000e+00	3.624e-29	0.000e+00	3.108e-30

DOS File: 1TB48.MS5
Run Date: June 25, 2008
Run Time: 11:29:39 AM
Duration: 00:00:12

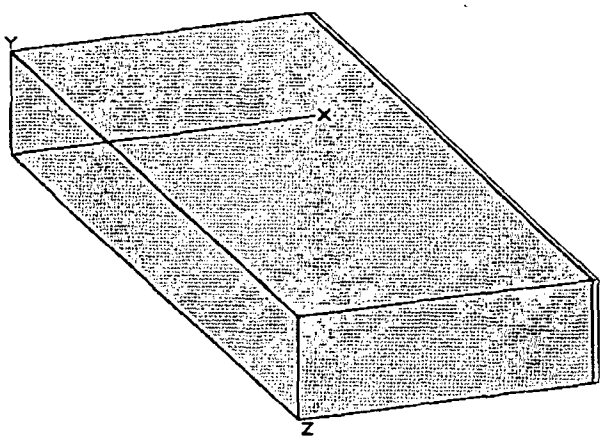
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.234e+10	0.000e+00	2.190e-25	0.000e+00	7.587e-27
0.03	6.611e+15	1.683e-103	8.486e-19	1.668e-105	8.410e-21
0.04	9.305e+10	2.958e-54	1.055e-22	1.308e-56	4.664e-25
0.05	3.130e+11	2.050e-34	3.220e-21	5.461e-37	8.578e-24
0.06	1.111e+11	3.227e-26	5.682e-21	6.410e-29	1.129e-23
0.08	5.049e+15	2.475e-14	3.891e-10	3.917e-17	6.157e-13
0.1	3.130e+11	1.411e-15	1.891e-11	2.158e-18	2.893e-14
0.15	1.945e+12	1.150e-11	8.215e-08	1.894e-14	1.353e-10
0.2	1.754e+14	3.778e-08	1.270e-04	6.667e-11	2.242e-07
0.3	3.396e+12	5.846e-08	5.994e-05	1.109e-10	1.137e-07
0.4	2.765e+13	8.462e-06	3.712e-03	1.649e-08	7.232e-06
0.5	1.686e+13	4.359e-05	1.030e-02	8.555e-08	2.023e-05
0.6	1.738e+13	2.403e-04	3.530e-02	4.690e-07	6.890e-05
0.8	8.726e+12	1.519e-03	1.121e-01	2.890e-06	2.133e-04
1.0	2.519e+12	2.832e-03	1.282e-01	5.221e-06	2.364e-04
1.5	2.144e+12	5.507e-02	1.156e+00	9.266e-05	1.945e-03
2.0	1.943e+11	3.513e-02	4.648e-01	5.433e-05	7.187e-04
3.0	3.527e+10	6.665e-02	5.189e-01	9.043e-05	7.040e-04
4.0	1.833e-01	1.391e-12	7.900e-12	1.721e-15	9.774e-15
TOTALS:	1.192e+16	1.615e-01	2.430e+00	2.461e-04	3.914e-03

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

Page : 1
DOS File: 1TB96.MS5
Run Date: June 25, 2008
Run Time: 11:30:27 AM
Duration: 00:00:11

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

Case Title: TB Dose
Description: 3' Shield - 96 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	6.7031e-005	2.4801e+006	5.9180e-010	2.1897e-005
Ba-137m	5.7025e+001	2.1099e+012	5.0346e-004	1.8628e+001
Ba-139				
Ba-140	4.0266e+001	1.4898e+012	3.5550e-004	1.3154e+001
Ce-141	1.0573e+000	3.9122e+010	9.3350e-006	3.4540e-001
Ce-143	1.4192e-001	5.2511e+009	1.2530e-006	4.6361e-002
Ce-144	9.5631e-001	3.5383e+010	8.4430e-006	3.1239e-001
Cm-242	1.6707e-002	6.1815e+008	1.4750e-007	5.4575e-003
Cm-244	9.9572e-004	3.6842e+007	8.7910e-009	3.2527e-004
Co-58	1.8202e-002	6.7347e+008	1.6070e-007	5.9459e-003
Co-60	1.0170e-002	3.7630e+008	8.9790e-008	3.3222e-003
Cs-134	7.9819e+001	2.9533e+012	7.0470e-004	2.6074e+001
Cs-136	2.0705e+001	7.6609e+011	1.8280e-004	6.7636e+000
Cs-137	6.0280e+001	2.2304e+012	5.3220e-004	1.9691e+001
I-131	1.1227e+003	4.1540e+013	9.9120e-003	3.6674e+002
I-132	5.0143e+001	1.8553e+012	4.4270e-004	1.6380e+001
I-133	1.3422e+002	4.9662e+012	1.1850e-003	4.3845e+001
I-134				
I-135	1.3263e-001	4.9075e+009	1.1710e-006	4.3327e-002
Kr-85	8.6298e+003	3.1930e+014	7.6190e-002	2.8190e+003
Kr-85m	5.5433e-002	2.0510e+009	4.8940e-007	1.8108e-002
Kr-87				
Kr-88	2.9041e-005	1.0745e+006	2.5640e-010	9.4868e-006
La-140	3.5532e+001	1.3147e+012	3.1370e-004	1.1607e+001
La-141	2.0127e-008	7.4471e+002	1.7770e-013	6.5749e-009

DOS File: 1TB96.MS5
Run Date: June 25, 2008
Run Time: 11:30:27 AM
Duration: 00:00:11

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	2.3537e+000	8.7086e+010	2.0780e-005	7.6886e-001
Nb-95	4.8920e-001	1.8100e+010	4.3190e-006	1.5980e-001
Nd-147	1.4407e-001	5.3308e+009	1.2720e-006	4.7064e-002
Np-239	4.1739e+000	1.5443e+011	3.6850e-005	1.3635e+000
Pr-143	4.1591e-001	1.5389e+010	3.6720e-006	1.3586e-001
Pr-144	9.4263e-001	3.4877e+010	8.3223e-006	3.0792e-001
Pu-238	2.9109e-003	1.0770e+008	2.5700e-008	9.5090e-004
Pu-239	3.1148e-004	1.1525e+007	2.7500e-009	1.0175e-004
Pu-240	4.9701e-004	1.8389e+007	4.3880e-009	1.6236e-004
Pu-241	1.2255e-001	4.5345e+009	1.0820e-006	4.0034e-002
Rb-86	8.5935e-001	3.1796e+010	7.5870e-006	2.8072e-001
Rh-103m	5.1096e+000	1.8905e+011	4.5111e-005	1.6691e+000
Rh-105	6.2262e-001	2.3037e+010	5.4970e-006	2.0339e-001
Rh-106	2.1724e+000	8.0381e+010	1.9180e-005	7.0966e-001
Ru-103	5.1230e+000	1.8955e+011	4.5230e-005	1.6735e+000
Ru-105	1.1768e-006	4.3543e+004	1.0390e-011	3.8443e-007
Ru-106	2.1724e+000	8.0381e+010	1.9180e-005	7.0966e-001
Sb-127	2.9200e+000	1.0804e+011	2.5780e-005	9.5386e-001
Sb-129	4.5318e-006	1.6768e+005	4.0010e-011	1.4804e-006
Sr-89	2.4862e+001	9.1989e+011	2.1950e-004	8.1215e+000
Sr-90	3.3470e+000	1.2384e+011	2.9550e-005	1.0934e+000
Sr-91	3.0389e-002	1.1244e+009	2.6830e-007	9.9271e-003
Sr-92	7.7078e-010	2.8519e+001	6.8050e-015	2.5179e-010
Tc-99m	2.4137e+000	8.9307e+010	2.1310e-005	7.8847e-001
Te-127	3.7899e+000	1.4023e+011	3.3460e-005	1.2380e+000
Te-127m	1.0085e+000	3.7315e+010	8.9040e-006	3.2945e-001
Te-129	3.4037e+000	1.2594e+011	3.0050e-005	1.1118e+000
Te-129m	3.9371e+000	1.4567e+011	3.4760e-005	1.2861e+000
Te-131m	1.4940e+000	5.5277e+010	1.3190e-005	4.8803e-001
Te-132	4.2010e+001	1.5544e+012	3.7090e-004	1.3723e+001
Xe-133	7.3363e+005	2.7144e+016	6.4770e+000	2.3965e+005
Xe-135	3.2598e+002	1.2061e+013	2.8780e-003	1.0649e+002
Y-90	2.1724e+000	8.0381e+010	1.9180e-005	7.0966e-001
Y-91	4.1036e-001	1.5183e+010	3.6230e-006	1.3405e-001
Y-92	7.8686e-007	2.9114e+004	6.9470e-012	2.5704e-007
Y-93	3.7570e-004	1.3901e+007	3.3170e-009	1.2273e-004
Zr-95	4.6949e-001	1.7371e+010	4.1450e-006	1.5336e-001
Zr-97	9.4600e-003	3.5002e+008	8.3520e-008	3.0902e-003

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.482e+07	0.000e+00	3.537e-29	0.000e+00	3.034e-30

For Information Only

DOS File: 1TB96.MS5
Run Date: June 25, 2008
Run Time: 11:30:27 AM
Duration: 00:00:11

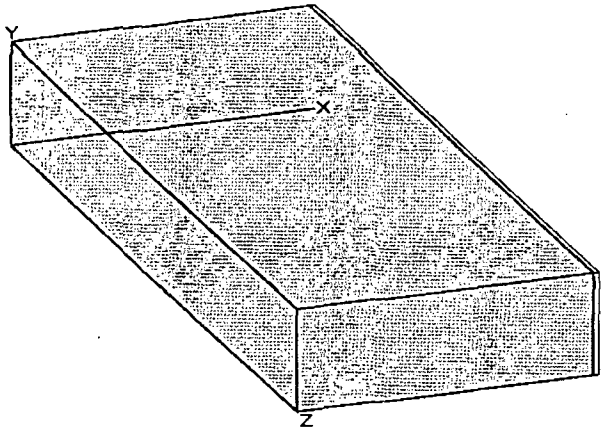
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.556e+10	0.000e+00	1.731e-25	0.000e+00	5.995e-27
0.03	1.302e+16	3.316e-103	1.672e-18	3.287e-105	1.657e-20
0.04	8.510e+10	2.705e-54	9.645e-23	1.196e-56	4.266e-25
0.05	2.047e+11	1.341e-34	2.106e-21	3.571e-37	5.610e-24
0.06	9.953e+10	2.891e-26	5.090e-21	5.742e-29	1.011e-23
0.08	9.963e+15	4.884e-14	7.678e-10	7.729e-17	1.215e-12
0.1	1.832e+11	8.257e-16	1.107e-11	1.263e-18	1.693e-14
0.15	3.602e+11	2.129e-12	1.521e-08	3.506e-15	2.505e-11
0.2	3.180e+13	6.848e-09	2.303e-05	1.209e-11	4.064e-08
0.3	3.665e+12	6.309e-08	6.468e-05	1.197e-10	1.227e-07
0.4	3.399e+13	1.040e-05	4.562e-03	2.027e-08	8.889e-06
0.5	7.645e+12	1.977e-05	4.674e-03	3.880e-08	9.174e-06
0.6	1.148e+13	1.587e-04	2.331e-02	3.098e-07	4.550e-05
0.8	7.007e+12	1.220e-03	9.003e-02	2.320e-06	1.712e-04
1.0	1.677e+12	1.886e-03	8.536e-02	3.476e-06	1.573e-04
1.5	1.760e+12	4.521e-02	9.491e-01	7.606e-05	1.597e-03
2.0	7.525e+10	1.361e-02	1.800e-01	2.104e-05	2.783e-04
3.0	4.681e+10	8.847e-02	6.887e-01	1.200e-04	9.344e-04
TOTALS:	2.309e+16	1.506e-01	2.026e+00	2.233e-04	3.202e-03

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

Page : 1
DOS File: 1TB240.MS5
Run Date: June 25, 2008
Run Time: 11:29:15 AM
Duration: 00:00:11

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

Case Title: TB Dose
Description: 3' Shield - 240 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm	163 ft
Width	1.3e+4 cm	430 ft 6.2 in
Height	1.7e+3 cm	57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	7.0191e-005	2.5971e+006	6.1970e-010	2.2929e-005
Ba-137m	5.9983e+001	2.2194e+012	5.2957e-004	1.9594e+001
Ba-139				
Ba-140	2.9030e+001	1.0741e+012	2.5630e-004	9.4831e+000
Ce-141	9.2946e-001	3.4390e+010	8.2060e-006	3.0362e-001
Ce-143	6.8889e-003	2.5489e+008	6.0820e-008	2.2503e-003
Ce-144	9.4158e-001	3.4839e+010	8.3130e-006	3.0758e-001
Cm-242	1.6276e-002	6.0223e+008	1.4370e-007	5.3169e-003
Cm-244	9.9414e-004	3.6783e+007	8.7770e-009	3.2475e-004
Co-58	1.7149e-002	6.3450e+008	1.5140e-007	5.6018e-003
Co-60	1.0140e-002	3.7517e+008	8.9520e-008	3.3122e-003
Cs-134	8.3523e+001	3.0903e+012	7.3740e-004	2.7284e+001
Cs-136	1.5857e+001	5.8672e+011	1.4000e-004	5.1800e+000
Cs-137	6.3406e+001	2.3460e+012	5.5980e-004	2.0713e+001
I-131	1.5370e+003	5.6870e+013	1.3570e-002	5.0209e+002
I-132	1.3977e+001	5.1715e+011	1.2340e-004	4.5658e+000
I-133	2.5417e+000	9.4043e+010	2.2440e-005	8.3028e-001
I-134				
I-135	8.4327e-008	3.1201e+003	7.4450e-013	2.7547e-008
Kr-85	3.6234e+004	1.3407e+015	3.1990e-001	1.1836e+004
Kr-85m	4.6700e-011	1.7279e+000	4.1230e-016	1.5255e-011
Kr-87				
Kr-88				
La-140	3.2779e+001	1.2128e+012	2.8940e-004	1.0708e+001
La-141				

DOS File: 1TB240.MS5
Run Date: June 25, 2008
Run Time: 11:29:15 AM
Duration: 00:00:11

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	5.1831e-001	1.9177e+010	4.5760e-006	1.6931e-001
Nb-95	4.8433e-001	1.7920e+010	4.2760e-006	1.5821e-001
Nd-147	9.8542e-002	3.6460e+009	8.7000e-007	3.2190e-002
Np-239	7.1312e-001	2.6386e+010	6.2960e-006	2.3295e-001
Pr-143	3.1681e-001	1.1722e+010	2.7970e-006	1.0349e-001
Pr-144	9.2812e-001	3.4340e+010	8.1941e-006	3.0318e-001
Pu-238	2.9109e-003	1.0770e+008	2.5700e-008	9.5090e-004
Pu-239	3.1216e-004	1.1550e+007	2.7560e-009	1.0197e-004
Pu-240	4.9656e-004	1.8373e+007	4.3840e-009	1.6221e-004
Pu-241	1.2233e-001	4.5261e+009	1.0800e-006	3.9960e-002
Rb-86	9.5234e-001	3.5237e+010	8.4080e-006	3.1110e-001
Rh-103m	4.5922e+000	1.6991e+011	4.0543e-005	1.5001e+000
Rh-105	3.6970e-002	1.3679e+009	3.2640e-007	1.2077e-002
Rh-106	2.1464e+000	7.9417e+010	1.8950e-005	7.0115e-001
Ru-103	4.6043e+000	1.7036e+011	4.0650e-005	1.5041e+000
Ru-105				
Ru-106	2.1464e+000	7.9417e+010	1.8950e-005	7.0115e-001
Sb-127	9.9063e-001	3.6653e+010	8.7460e-006	3.2360e-001
Sb-129				
Sr-89	2.2880e+001	8.4655e+011	2.0200e-004	7.4740e+000
Sr-90	3.3425e+000	1.2367e+011	2.9510e-005	1.0919e+000
Sr-91	8.3069e-007	3.0736e+004	7.3340e-012	2.7136e-007
Sr-92				
Tc-99m	5.3145e-001	1.9663e+010	4.6920e-006	1.7360e-001
Te-127	1.9391e+000	7.1747e+010	1.7120e-005	6.3344e-001
Te-127m	9.8191e-001	3.6331e+010	8.6690e-006	3.2075e-001
Te-129	3.0050e+000	1.1118e+011	2.6530e-005	9.8161e-001
Te-129m	3.4750e+000	1.2858e+011	3.0680e-005	1.1352e+000
Te-131m	5.3575e-002	1.9823e+009	4.7300e-007	1.7501e-002
Te-132	1.1712e+001	4.3333e+011	1.0340e-004	3.8258e+000
Xe-133	1.3954e+006	5.1631e+016	1.2320e+001	4.5584e+005
Xe-135	2.3220e-002	8.5912e+008	2.0500e-007	7.5850e-003
Y-90	3.1114e+000	1.1512e+011	2.7470e-005	1.0164e+000
Y-91	3.8193e-001	1.4132e+010	3.3720e-006	1.2476e-001
Y-92				
Y-93	1.9165e-008	7.0909e+002	1.6920e-013	6.2604e-009
Zr-95	4.3959e-001	1.6265e+010	3.8810e-006	1.4360e-001
Zr-97	2.5734e-005	9.5216e+005	2.2720e-010	8.4064e-006

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.466e+07	0.000e+00	3.499e-29	0.000e+00	3.001e-30

DOS File: 1TB240.MS5
Run Date: June 25, 2008
Run Time: 11:29:15 AM
Duration: 00:00:11

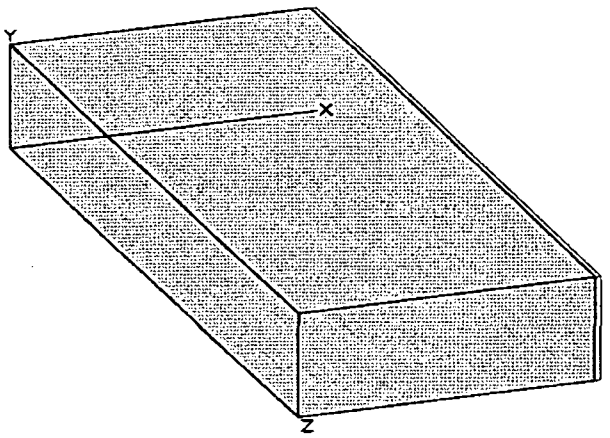
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.660e+10	0.000e+00	1.124e-25	0.000e+00	3.894e-27
0.03	2.477e+16	6.307e-103	3.180e-18	6.250e-105	3.151e-20
0.04	7.369e+10	2.342e-54	8.351e-23	1.036e-56	3.694e-25
0.05	5.748e+10	3.765e-35	5.914e-22	1.003e-37	1.576e-24
0.06	7.415e+10	2.154e-26	3.792e-21	4.278e-29	7.532e-24
0.08	1.895e+16	9.290e-14	1.460e-09	1.470e-16	2.311e-12
0.1	4.231e+10	1.907e-16	2.556e-12	2.917e-19	3.910e-15
0.15	1.975e+11	1.168e-12	8.342e-09	1.923e-15	1.374e-11
0.2	3.738e+13	8.050e-09	2.707e-05	1.421e-11	4.777e-08
0.3	4.407e+12	7.587e-08	7.778e-05	1.439e-10	1.475e-07
0.4	4.627e+13	1.416e-05	6.210e-03	2.759e-08	1.210e-05
0.5	7.297e+12	1.887e-05	4.461e-03	3.704e-08	8.756e-06
0.6	1.071e+13	1.480e-04	2.175e-02	2.889e-07	4.244e-05
0.8	5.473e+12	9.529e-04	7.033e-02	1.812e-06	1.338e-04
1.0	9.624e+11	1.082e-03	4.899e-02	1.995e-06	9.029e-05
1.5	1.335e+12	3.431e-02	7.202e-01	5.772e-05	1.212e-03
2.0	2.766e+10	5.002e-03	6.617e-02	7.735e-06	1.023e-04
3.0	4.319e+10	8.162e-02	6.354e-01	1.107e-04	8.620e-04
TOTALS:	4.383e+16	1.231e-01	1.574e+00	1.803e-04	2.464e-03

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

Page : 1
DOS File: 1TB480.MS5
Run Date: June 25, 2008
Run Time: 11:29:51 AM
Duration: 00:00:11

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

Case Title: TB Dose
Description: 3' Shield - 480 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	7.5447e-005	2.7915e+006	6.6610e-010	2.4646e-005
Ba-137m	6.3443e+001	2.3474e+012	5.6013e-004	2.0725e+001
Ba-139				
Ba-140	1.6820e+001	6.2234e+011	1.4850e-004	5.4945e+000
Ce-141	7.4994e-001	2.7748e+010	6.6210e-006	2.4498e-001
Ce-143	4.4480e-005	1.6457e+006	3.9270e-010	1.4530e-005
Ce-144	9.1768e-001	3.3954e+010	8.1020e-006	2.9977e-001
Cm-242	1.5574e-002	5.7624e+008	1.3750e-007	5.0875e-003
Cm-244	9.9176e-004	3.6695e+007	8.7560e-009	3.2397e-004
Co-58	1.5529e-002	5.7457e+008	1.3710e-007	5.0727e-003
Co-60	1.0089e-002	3.7328e+008	8.9070e-008	3.2956e-003
Cs-134	8.7589e+001	3.2408e+012	7.7330e-004	2.8612e+001
Cs-136	9.8870e+000	3.6582e+011	8.7290e-005	3.2297e+000
Cs-137	6.7065e+001	2.4814e+012	5.9210e-004	2.1908e+001
I-131	1.4362e+003	5.3140e+013	1.2680e-002	4.6916e+002
I-132	1.6639e+000	6.1564e+010	1.4690e-005	5.4353e-001
I-133	1.8904e-003	6.9945e+007	1.6690e-008	6.1753e-004
I-134				
I-135				
Kr-85	1.0982e+005	4.0635e+015	9.6960e-001	3.5875e+004
Kr-85m				
Kr-87				
Kr-88				
La-140	1.9527e+001	7.2250e+011	1.7240e-004	6.3788e+000
La-141				

DOS File: 1TB480.MS5
Run Date: June 25, 2008
Run Time: 11:29:51 AM
Duration: 00:00:11

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	4.1625e-002	1.5401e+009	3.6750e-007	1.3598e-002
Nb-95	4.7073e-001	1.7417e+010	4.1560e-006	1.5377e-001
Nd-147	5.2340e-002	1.9366e+009	4.6210e-007	1.7098e-002
Np-239	3.7525e-002	1.3884e+009	3.3130e-007	1.2258e-002
Pr-143	1.9017e-001	7.0364e+009	1.6790e-006	6.2123e-002
Pr-144	9.0456e-001	3.3469e+010	7.9861e-006	2.9549e-001
Pu-238	2.9087e-003	1.0762e+008	2.5680e-008	9.5016e-004
Pu-239	3.1194e-004	1.1542e+007	2.7540e-009	1.0190e-004
Pu-240	4.9588e-004	1.8348e+007	4.3780e-009	1.6199e-004
Pu-241	1.2199e-001	4.5135e+009	1.0770e-006	3.9849e-002
Rb-86	8.9243e-001	3.3020e+010	7.8790e-006	2.9152e-001
Rh-103m	3.8443e+000	1.4224e+011	3.3941e-005	1.2558e+000
Rh-105	3.3425e-004	1.2367e+007	2.9510e-009	1.0919e-004
Rh-106	2.1034e+000	7.7824e+010	1.8570e-005	6.8709e-001
Ru-103	3.8545e+000	1.4261e+011	3.4030e-005	1.2591e+000
Ru-105				
Ru-106	2.1034e+000	7.7824e+010	1.8570e-005	6.8709e-001
Sb-127	1.6344e-001	6.0474e+009	1.4430e-006	5.3391e-002
Sb-129				
Sr-89	1.9912e+001	7.3675e+011	1.7580e-004	6.5046e+000
Sr-90	3.3357e+000	1.2342e+011	2.9450e-005	1.0897e+000
Sr-91				
Sr-92				
Tc-99m	4.2667e-002	1.5787e+009	3.7670e-007	1.3938e-002
Te-127	1.0986e+000	4.0647e+010	9.6990e-006	3.5886e-001
Te-127m	9.2505e-001	3.4227e+010	8.1670e-006	3.0218e-001
Te-129	2.4420e+000	9.0355e+010	2.1560e-005	7.9772e-001
Te-129m	2.8237e+000	1.0448e+011	2.4930e-005	9.2241e-001
Te-131m	2.0898e-004	7.7321e+006	1.8450e-009	6.8265e-005
Te-132	1.3932e+000	5.1547e+010	1.2300e-005	4.5510e-001
Xe-133	1.1296e+006	4.1795e+016	9.9730e+000	3.6900e+005
Xe-135	7.8935e-010	2.9206e+001	6.9690e-015	2.5785e-010
Y-90	3.3357e+000	1.2342e+011	2.9450e-005	1.0897e+000
Y-91	3.3878e-001	1.2535e+010	2.9910e-006	1.1067e-001
Y-92				
Y-93				
Zr-95	3.9394e-001	1.4576e+010	3.4780e-006	1.2869e-001
Zr-97	1.3649e-009	5.0500e+001	1.2050e-014	4.4585e-010

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.425e+07	0.000e+00	3.401e-29	0.000e+00	2.917e-30

DOS File: 1TB480.MS5
Run Date: June 25, 2008
Run Time: 11:29:51 AM
Duration: 00:00:11

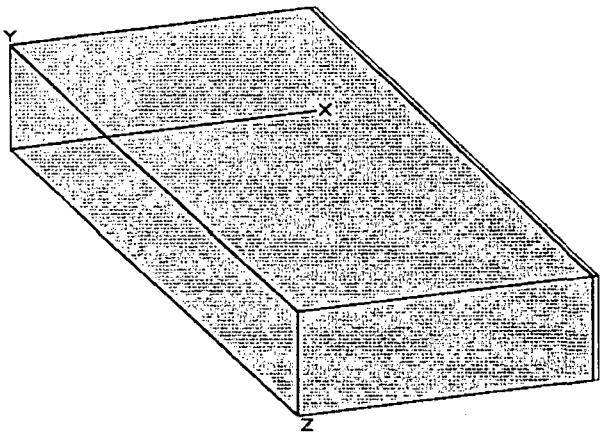
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.235e+10	0.000e+00	8.360e-26	0.000e+00	2.896e-27
0.03	2.005e+16	5.105e-103	2.574e-18	5.060e-105	2.551e-20
0.04	6.281e+10	1.997e-54	7.119e-23	8.830e-57	3.148e-25
0.05	7.293e+09	4.777e-36	7.504e-23	1.273e-38	1.999e-25
0.06	4.587e+10	1.332e-26	2.346e-21	2.646e-29	4.659e-24
0.08	1.534e+16	7.520e-14	1.182e-09	1.190e-16	1.871e-12
0.1	6.977e+09	3.144e-17	4.214e-13	4.810e-20	6.447e-16
0.15	1.133e+11	6.698e-13	4.786e-09	1.103e-15	7.881e-12
0.2	2.999e+13	6.459e-09	2.172e-05	1.140e-11	3.833e-08
0.3	3.882e+12	6.684e-08	6.853e-05	1.268e-10	1.300e-07
0.4	4.319e+13	1.322e-05	5.797e-03	2.575e-08	1.129e-05
0.5	1.853e+13	4.792e-05	1.133e-02	9.407e-08	2.224e-05
0.6	1.012e+13	1.400e-04	2.056e-02	2.733e-07	4.014e-05
0.8	4.710e+12	8.200e-04	6.053e-02	1.560e-06	1.151e-04
1.0	5.567e+11	6.259e-04	2.833e-02	1.154e-06	5.223e-05
1.5	7.990e+11	2.053e-02	4.309e-01	3.454e-05	7.250e-04
2.0	8.430e+09	1.524e-03	2.016e-02	2.357e-06	3.118e-05
3.0	2.573e+10	4.862e-02	3.785e-01	6.596e-05	5.135e-04
TOTALS:	3.550e+16	7.232e-02	9.562e-01	1.060e-04	1.511e-03

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

Page : 1
DOS File: 1TB720.MS5
Run Date: June 25, 2008
Run Time: 11:30:03 AM
Duration: 00:00:11

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

Case Title: TB Dose
Description: 3' Shield - 720 Hour
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	5.0e+3 cm		163 ft
Width	1.3e+4 cm	430 ft	6.2 in
Height	1.7e+3 cm		57 ft

Dose Points

	X	Y	Z
# 1	5074.92 cm	868.68 cm	6.56e+03 cm
	166 ft 6.0 in	28 ft 6.0 in	215 ft 3.1 in

Shields

Shield Name	Dimension	Material	Density
Source	1.13e+11 cm³	Air	0.00122
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	8.0680e-005	2.9851e+006	7.1230e-010	2.6355e-005
Ba-137m	6.5640e+001	2.4287e+012	5.7952e-004	2.1442e+001
Ba-139				
Ba-140	9.7500e+000	3.6075e+011	8.6080e-005	3.1850e+000
Ce-141	6.0496e-001	2.2383e+010	5.3410e-006	1.9762e-001
Ce-143	2.8724e-007	1.0628e+004	2.5360e-012	9.3832e-008
Ce-144	8.9424e-001	3.3087e+010	7.8950e-006	2.9211e-001
Cm-242	1.4906e-002	5.5152e+008	1.3160e-007	4.8692e-003
Cm-244	9.8927e-004	3.6603e+007	8.7340e-009	3.2316e-004
Co-58	1.4056e-002	5.2008e+008	1.2410e-007	4.5917e-003
Co-60	1.0038e-002	3.7139e+008	8.8620e-008	3.2789e-003
Cs-134	8.9854e+001	3.3246e+012	7.9330e-004	2.9352e+001
Cs-136	6.0303e+000	2.2312e+011	5.3240e-005	1.9699e+000
Cs-137	6.9387e+001	2.5673e+012	6.1260e-004	2.2666e+001
I-131	9.9029e+002	3.6641e+013	8.7430e-003	3.2349e+002
I-132	1.9788e-001	7.3214e+009	1.7470e-006	6.4639e-002
I-133	1.0384e-006	3.8422e+004	9.1680e-012	3.3922e-007
I-134				
I-135				
Kr-85	2.0252e+005	7.4932e+015	1.7880e+000	6.6156e+004
Kr-85m				
Kr-87				
Kr-88				
La-140	1.1325e+001	4.1904e+011	9.9990e-005	3.6996e+000
La-141				

DOS File: 1TB720.MS5
Run Date: June 25, 2008
Run Time: 11:30:03 AM
Duration: 00:00:11

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
La-142				
Mo-99	3.3425e-003	1.2367e+008	2.9510e-008	1.0919e-003
Nb-95	4.5182e-001	1.6717e+010	3.9890e-006	1.4759e-001
Nd-147	2.7796e-002	1.0284e+009	2.4540e-007	9.0798e-003
Np-239	1.9742e-003	7.3047e+007	1.7430e-008	6.4491e-004
Pr-143	1.1395e-001	4.2160e+009	1.0060e-006	3.7222e-002
Pr-144	8.8145e-001	3.2614e+010	7.7821e-006	2.8794e-001
Pu-238	2.9075e-003	1.0758e+008	2.5670e-008	9.4979e-004
Pu-239	3.1148e-004	1.1525e+007	2.7500e-009	1.0175e-004
Pu-240	4.9520e-004	1.8322e+007	4.3720e-009	1.6176e-004
Pu-241	1.2165e-001	4.5010e+009	1.0740e-006	3.9738e-002
Rb-86	7.2275e-001	2.6742e+010	6.3810e-006	2.3610e-001
Rh-103m	3.2173e+000	1.1904e+011	2.8405e-005	1.0510e+000
Rh-105	3.0219e-006	1.1181e+005	2.6680e-011	9.8716e-007
Rh-106	2.0614e+000	7.6274e+010	1.8200e-005	6.7340e-001
Ru-103	3.2258e+000	1.1936e+011	2.8480e-005	1.0538e+000
Ru-105				
Ru-106	2.0614e+000	7.6274e+010	1.8200e-005	6.7340e-001
Sb-127	2.6969e-002	9.9784e+008	2.3810e-007	8.8097e-003
Sb-129				
Sr-89	1.7341e+001	6.4162e+011	1.5310e-004	5.6647e+000
Sr-90	3.3289e+000	1.2317e+011	2.9390e-005	1.0874e+000
Sr-91				
Sr-92				
Tc-99m	3.4263e-003	1.2677e+008	3.0250e-008	1.1193e-003
Te-127	9.1089e-001	3.3703e+010	8.0420e-006	2.9755e-001
Te-127m	8.6762e-001	3.2102e+010	7.6600e-006	2.8342e-001
Te-129	1.9833e+000	7.3382e+010	1.7510e-005	6.4787e-001
Te-129m	2.2936e+000	8.4865e+010	2.0250e-005	7.4925e-001
Te-131m	8.1506e-007	3.0157e+004	7.1960e-012	2.6625e-007
Te-132	1.6582e-001	6.1354e+009	1.4640e-006	5.4168e-002
Xe-133	5.5659e+005	2.0594e+016	4.9140e+000	1.8182e+005
Xe-135				
Y-90	3.3459e+000	1.2380e+011	2.9540e-005	1.0930e+000
Y-91	3.0050e-001	1.1118e+010	2.6530e-006	9.8161e-002
Y-92				
Y-93				
Zr-95	3.5294e-001	1.3059e+010	3.1160e-006	1.1529e-001
Zr-97				

Buildup
The material reference is : Source

Integration Parameters

X Direction	20
Y Direction	20
Z Direction	20

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.368e+07	0.000e+00	3.264e-29	0.000e+00	2.800e-30

DOS File: 1TB720.MS5
Run Date: June 25, 2008
Run Time: 11:30:03 AM
Duration: 00:00:11

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.021e+10	0.000e+00	6.913e-26	0.000e+00	2.394e-27
0.03	9.880e+15	2.516e-103	1.268e-18	2.493e-105	1.257e-20
0.04	5.596e+10	1.779e-54	6.342e-23	7.867e-57	2.805e-25
0.05	1.250e+09	8.189e-37	1.286e-23	2.182e-39	3.427e-26
0.06	2.799e+10	8.130e-27	1.431e-21	1.615e-29	2.843e-24
0.08	7.559e+15	3.706e-14	5.825e-10	5.864e-17	9.218e-13
0.1	2.672e+09	1.204e-17	1.614e-13	1.842e-20	2.469e-16
0.15	7.080e+10	4.185e-13	2.990e-09	6.892e-16	4.924e-12
0.2	1.479e+13	3.186e-09	1.071e-05	5.623e-12	1.891e-08
0.3	2.638e+12	4.542e-08	4.657e-05	8.616e-11	8.834e-08
0.4	2.977e+13	9.111e-06	3.996e-03	1.775e-08	7.786e-06
0.5	3.312e+13	8.563e-05	2.025e-02	1.681e-07	3.974e-05
0.6	8.992e+12	1.243e-04	1.826e-02	2.427e-07	3.565e-05
0.8	4.192e+12	7.299e-04	5.387e-02	1.388e-06	1.025e-04
1.0	3.675e+11	4.132e-04	1.871e-02	7.617e-07	3.448e-05
1.5	5.034e+11	1.293e-02	2.715e-01	2.176e-05	4.568e-04
2.0	4.058e+09	7.338e-04	9.708e-03	1.135e-06	1.501e-05
3.0	1.492e+10	2.820e-02	2.195e-01	3.826e-05	2.978e-04
TOTALS:	1.753e+16	4.323e-02	6.159e-01	6.373e-05	9.898e-04

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.	PROJECT	Calc. No. EC-RADN-1129
Date 07/07/2008	DBA-LOCA Total Control Room Dose	
Designed By T.F. Mackay		Sh. No. 251
Checked By R.A.Vazquies		

ATTACHMENT 6
MICROSHIELD COMPUTER CODE OUTPUT
SGTS FILTER SHINE

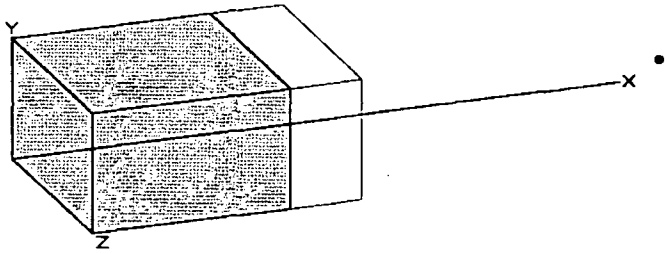
Attachment 5 pages 251 to 290 revised

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

Page : 1
DOS File: SGTS166.MS5
Run Date: June 26, 2008
Run Time: 9:54:35 AM
Duration: 00:00:16

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

Case Title: SGTS Filter
Description: Time = .1667 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241				
Ba-137m	1.5779e-001	5.8383e+009	1.5032e-002	5.5618e+002
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	2.2170e-001	8.2029e+009	2.1120e-002	7.8144e+002
Cs-136	7.0760e-002	2.6181e+009	6.7409e-003	2.4941e+002
Cs-137	1.6680e-001	6.1716e+009	1.5890e-002	5.8793e+002
I-131	1.0470e+000	3.8739e+010	9.9741e-002	3.6904e+003
I-132	1.4660e+000	5.4242e+010	1.3966e-001	5.1673e+003
I-133	2.1670e+000	8.0179e+010	2.0644e-001	7.6382e+003
I-134	2.1080e+000	7.7996e+010	2.0082e-001	7.4302e+003
I-135	2.0330e+000	7.5221e+010	1.9367e-001	7.1659e+003
La-140				
La-141				
La-142				
Mo-99				
Nb-95				
Nd-147				

For Information Only
DOS File: SGTS166.MS5
Run Date: June 26, 2008
Run Time: 9:54:35 AM
Duration: 00:00:16

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	2.0920e-003	7.7404e+007	1.9929e-004	7.3738e+000
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	4.716e+09	4.025e-108	4.695e-25	3.989e-110	4.653e-27
0.04	1.799e+08	1.861e-55	4.749e-26	8.233e-58	2.100e-28
0.06	3.263e+08	2.736e-27	2.035e-24	5.434e-30	4.043e-27
0.08	1.179e+09	1.539e-19	1.347e-17	2.436e-22	2.132e-20
0.1	1.070e+07	1.236e-18	2.423e-16	1.892e-21	3.707e-19
0.15	4.212e+09	6.226e-13	2.430e-10	1.025e-15	4.001e-13

For Information Only
DOS File: SGTS166.MS5
Run Date: June 26, 2008
Run Time: 9:54:35 AM
Duration: 00:00:16

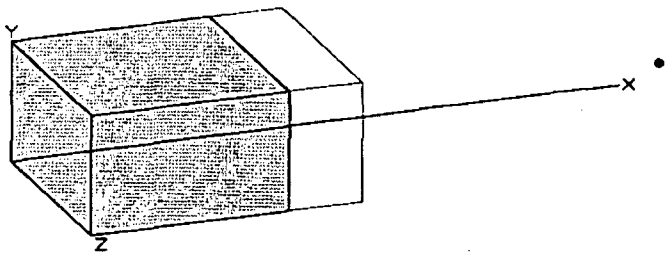
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.2	4.320e+09	2.332e-11	1.022e-08	4.116e-14	1.803e-11
0.3	9.156e+09	4.011e-09	1.232e-06	7.609e-12	2.336e-09
0.4	4.687e+10	3.714e-07	7.226e-05	7.236e-10	1.408e-07
0.5	1.002e+11	6.813e-06	8.918e-04	1.337e-08	1.750e-06
0.6	1.153e+11	4.248e-05	3.962e-03	8.291e-08	7.733e-06
0.8	2.117e+11	1.005e-03	5.496e-02	1.911e-06	1.045e-04
1.0	8.188e+10	2.558e-03	9.345e-02	4.715e-06	1.723e-04
1.5	6.181e+10	4.583e-02	8.556e-01	7.711e-05	1.440e-03
2.0	1.631e+10	8.772e-02	1.099e+00	1.356e-04	1.699e-03
TOTALS:	6.582e+11	1.372e-01	2.108e+00	2.195e-04	3.425e-03

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

Page : 1
DOS File: SGTS05.MS5
Run Date: June 25, 2008
Run Time: 2:54:57 PM
Duration: 00:00:16

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

Case Title: SGTS Filter
Description: Time = 0.5 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241				
Ba-137m	1.1560e+000	4.2772e+010	1.1013e-001	4.0747e+003
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	1.6230e+000	6.0051e+010	1.5461e-001	5.7207e+003
Cs-136	5.1780e-001	1.9159e+010	4.9328e-002	1.8251e+003
Cs-137	1.2220e+000	4.5214e+010	1.1641e-001	4.3073e+003
I-131	7.6910e+000	2.8457e+011	7.3268e-001	2.7109e+004
I-132	9.9630e+000	3.6863e+011	9.4912e-001	3.5117e+004
I-133	1.5760e+001	5.8312e+011	1.5014e+000	5.5550e+004
I-134	1.1910e+001	4.4067e+011	1.1346e+000	4.1980e+004
I-135	1.4430e+001	5.3391e+011	1.3747e+000	5.0862e+004
La-140				
La-141				
La-142				
Mo-99				
Nb-95				
Nd-147				

DOS File: SGTS05.MS5
Run Date: June 25, 2008
Run Time: 2:54:57 PM
Duration: 00:00:16

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	1.5310e-002	5.6647e+008	1.4585e-003	5.3964e+001
Rh-105				
Rh-106				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	3.236e+10	2.762e-107	3.222e-24	2.737e-109	3.193e-26
0.04	1.317e+09	1.363e-54	3.477e-25	6.028e-57	1.538e-27
0.06	2.388e+09	2.002e-26	1.490e-23	3.977e-29	2.959e-26
0.08	8.654e+09	1.130e-18	9.892e-17	1.788e-21	1.565e-19
0.1	7.831e+07	9.048e-18	1.773e-15	1.384e-20	2.712e-18
0.15	2.450e+10	3.621e-12	1.413e-09	5.963e-15	2.327e-12
0.2	2.744e+10	1.481e-10	6.488e-08	2.614e-13	1.145e-10
0.3	6.491e+10	2.844e-08	8.731e-06	5.395e-11	1.656e-08

DOS File: SGTS05.MS5
Run Date: June 25, 2008
Run Time: 2:54:57 PM
Duration: 00:00:16

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.4	3.259e+11	2.582e-06	5.024e-04	5.031e-09	9.790e-07
0.5	7.051e+11	4.792e-05	6.274e-03	9.407e-08	1.231e-05
0.6	7.637e+11	2.813e-04	2.624e-02	5.490e-07	5.121e-05
0.8	1.292e+12	6.131e-03	3.354e-01	1.166e-05	6.380e-04
1.0	5.338e+11	1.668e-02	6.092e-01	3.074e-05	1.123e-03
1.5	4.214e+11	3.125e-01	5.834e+00	5.257e-04	9.815e-03
2.0	1.062e+11	5.711e-01	7.152e+00	8.831e-04	1.106e-02
TOTALS:	4.310e+12	9.067e-01	1.396e+01	1.452e-03	2.270e-02

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

Page : 1
DOS File: SGTS1.MS5
Run Date: June 26, 2008
Run Time: 10:09:25 AM
Duration: 00:00:21

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

Case Title: SGTS Filter
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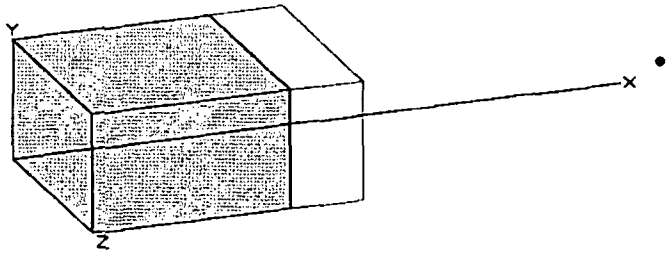
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	2.3600e-006	8.7320e+004	2.2482e-007	8.3185e-003
Ba-137m	8.1687e+000	3.0224e+011	7.7818e-001	2.8793e+004
Ba-139	1.0390e+000	3.8443e+010	9.8979e-002	3.6622e+003
Ba-140	1.7210e+000	6.3677e+010	1.6395e-001	6.0661e+003
Ce-141	3.9560e-002	1.4637e+009	3.7686e-003	1.3944e+002
Ce-143	3.5970e-002	1.3309e+009	3.4266e-003	1.2679e+002
Ce-144	3.3270e-002	1.2310e+009	3.1694e-003	1.1727e+002
Cm-242	5.8550e-004	2.1664e+007	5.5777e-005	2.0638e+000
Cm-244	3.4320e-005	1.2698e+006	3.2695e-006	1.2097e-001
Co-58	6.5190e-004	2.4120e+007	6.2103e-005	2.2978e+000
Co-60	3.5090e-004	1.2983e+007	3.3428e-005	1.2368e+000
Cs-134	1.1470e+001	4.2439e+011	1.0927e+000	4.0429e+004
Cs-136	3.6550e+000	1.3524e+011	3.4819e-001	1.2883e+004
Cs-137	8.6350e+000	3.1950e+011	8.2260e-001	3.0436e+004
I-131	5.6920e+001	2.1060e+012	5.4224e+000	2.0063e+005
I-132	6.7290e+001	2.4897e+012	6.4103e+000	2.3718e+005
I-133	1.1490e+002	4.2513e+012	1.0946e+001	4.0500e+005
I-134	5.9430e+001	2.1989e+012	5.6615e+000	2.0948e+005
I-135	1.0150e+002	3.7555e+012	9.6693e+000	3.5776e+005
La-140	3.0600e-002	1.1322e+009	2.9151e-003	1.0786e+002
La-141	1.3120e-002	4.8544e+008	1.2499e-003	4.6245e+001
La-142	9.7800e-003	3.6186e+008	9.3168e-004	3.4472e+001
Mo-99	2.1990e-001	8.1363e+009	2.0949e-002	7.7510e+002
Nb-95	1.6890e-002	6.2493e+008	1.6090e-003	5.9533e+001
Nd-147	6.3720e-003	2.3576e+008	6.0702e-004	2.2460e+001

DOS File: SGTS1.MS5
Run Date: June 26, 2008
Run Time: 10:09:25 AM
Duration: 00:00:21

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	4.6100e-001	1.7057e+010	4.3917e-002	1.6249e+003
Pr-143	1.4180e-002	5.2466e+008	1.3508e-003	4.9981e+001
Pr-144	3.2794e-002	1.2134e+009	3.1241e-003	1.1559e+002
Pu-238	1.0030e-004	3.7111e+006	9.5550e-006	3.5353e-001
Pu-239	1.0650e-005	3.9405e+005	1.0146e-006	3.7539e-002
Pu-240	1.7120e-005	6.3344e+005	1.6309e-006	6.0344e-002
Pu-241	4.2230e-003	1.5625e+008	4.0230e-004	1.4885e+001
Rb-86	1.0810e-001	3.9997e+009	1.0298e-002	3.8103e+002
Rh-103m	1.8880e-001	6.9857e+009	1.7986e-002	6.6548e+002
Rh-105	1.2200e-001	4.5140e+009	1.1622e-002	4.3002e+002
Rh-106	7.5410e-002	2.7902e+009	7.1839e-003	2.6580e+002
Ru-103	1.8930e-001	7.0041e+009	1.8033e-002	6.6724e+002
Ru-105	1.1200e-001	4.1440e+009	1.0670e-002	3.9477e+002
Ru-106	7.5410e-002	2.7902e+009	7.1839e-003	2.6580e+002
Sb-127	2.0520e-001	7.5924e+009	1.9548e-002	7.2328e+002
Sb-129	6.5070e-001	2.4076e+010	6.1988e-002	2.2936e+003
Sr-89	9.0450e-001	3.3467e+010	8.6166e-002	3.1882e+003
Sr-90	1.1530e-001	4.2661e+009	1.0984e-002	4.0641e+002
Sr-91	1.0720e+000	3.9664e+010	1.0212e-001	3.7786e+003
Sr-92	9.4810e-001	3.5080e+010	9.0320e-002	3.3418e+003
Tc-99m	1.9680e-001	7.2816e+009	1.8748e-002	6.9367e+002
Te-127	2.0490e-001	7.5813e+009	1.9520e-002	7.2223e+002
Te-127m	3.4960e-002	1.2935e+009	3.3304e-003	1.2323e+002
Te-129	6.9190e-001	2.5600e+010	6.5913e-002	2.4388e+003
Te-129m	1.4640e-001	5.4168e+009	1.3947e-002	5.1603e+002
Te-131m	4.6210e-001	1.7098e+010	4.4021e-002	1.6288e+003
Te-132	3.3590e+000	1.2428e+011	3.1999e-001	1.1840e+004
Y-90	1.7120e-003	6.3344e+007	1.6309e-004	6.0344e+000
Y-91	1.1870e-002	4.3919e+008	1.1308e-003	4.1839e+001
Y-92	9.0700e-002	3.3559e+009	8.6404e-003	3.1970e+002
Y-93	8.7810e-003	3.2490e+008	8.3651e-004	3.0951e+001
Zr-95	1.6890e-002	6.2493e+008	1.6090e-003	5.9533e+001
Zr-97	1.6040e-002	5.9348e+008	1.5280e-003	5.6537e+001

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	8.129e+05	0.000e+00	2.326e-29	0.000e+00	1.995e-30
0.02	1.428e+09	0.000e+00	6.429e-26	0.000e+00	2.227e-27
0.03	3.205e+11	2.735e-106	3.191e-23	2.711e-108	3.162e-25
0.04	1.115e+10	1.154e-53	2.944e-24	5.104e-56	1.302e-26
0.05	1.634e+10	3.284e-34	1.410e-23	8.749e-37	3.756e-26
0.06	1.731e+10	1.452e-25	1.080e-22	2.884e-28	2.145e-25

DOS File: SGTS1.MS5
Run Date: June 26, 2008
Run Time: 10:09:25 AM
Duration: 00:00:21

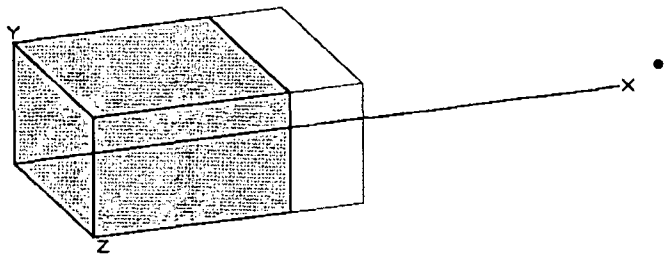
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	6.441e+10	8.411e-18	7.362e-16	1.331e-20	1.165e-18
0.1	1.917e+10	2.214e-15	4.339e-13	3.388e-18	6.639e-16
0.15	1.488e+11	2.199e-11	8.582e-09	3.622e-14	1.413e-11
0.2	2.842e+11	1.534e-09	6.721e-07	2.708e-12	1.186e-09
0.3	4.698e+11	2.058e-07	6.319e-05	3.905e-10	1.199e-07
0.4	2.269e+12	1.798e-05	3.499e-03	3.503e-08	6.817e-06
0.5	4.984e+12	3.388e-04	4.435e-02	6.650e-07	8.705e-05
0.6	4.964e+12	1.828e-03	1.705e-01	3.569e-06	3.329e-04
0.8	7.468e+12	3.544e-02	1.939e+00	6.740e-05	3.688e-03
1.0	3.416e+12	1.067e-01	3.898e+00	1.967e-04	7.186e-03
1.5	2.869e+12	2.128e+00	3.972e+01	3.580e-03	6.683e-02
2.0	6.726e+11	3.617e+00	4.531e+01	5.594e-03	7.006e-02
3.0	1.395e+08	8.208e-03	6.304e-02	1.114e-05	8.553e-05
4.0	9.499e+06	2.321e-03	1.320e-02	2.872e-06	1.633e-05
TOTALS:	2.800e+13	5.900e+00	9.116e+01	9.456e-03	1.483e-01

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

Page : 1
DOS File: SGTS2.MS5
Run Date: June 25, 2008
Run Time: 2:56:16 PM
Duration: 00:00:21

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

Case Title: SGTS Filter
Description: Time = 2 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	5.4350e-005	2.0110e+006	5.1776e-006	1.9157e-001
Ba-137m	6.4763e+001	2.3962e+012	6.1696e+000	2.2828e+005
Ba-139	1.5260e+001	5.6462e+011	1.4537e+000	5.3788e+004
Ba-140	4.1710e+001	1.5433e+012	3.9735e+000	1.4702e+005
Ce-141	9.6060e-001	3.5542e+010	9.1511e-002	3.3859e+003
Ce-143	8.5570e-001	3.1661e+010	8.1517e-002	3.0161e+003
Ce-144	8.0820e-001	2.9903e+010	7.6992e-002	2.8487e+003
Cm-242	1.4220e-002	5.2614e+008	1.3547e-003	5.0122e+001
Cm-244	8.3380e-004	3.0851e+007	7.9431e-005	2.9390e+000
Co-58	1.5830e-002	5.8571e+008	1.5080e-003	5.5797e+001
Co-60	8.5250e-003	3.1543e+008	8.1213e-004	3.0049e+001
Cs-134	9.0960e+001	3.3655e+012	8.6652e+000	3.2061e+005
Cs-136	2.8920e+001	1.0700e+012	2.7550e+000	1.0194e+005
Cs-137	6.8460e+001	2.5330e+012	6.5218e+000	2.4131e+005
I-131	4.9130e+002	1.8178e+013	4.6803e+001	1.7317e+006
I-132	4.9970e+002	1.8489e+013	4.7603e+001	1.7613e+006
I-133	9.6210e+002	3.5598e+013	9.1654e+001	3.3912e+006
I-134	2.3340e+002	8.6358e+012	2.2235e+001	8.2268e+005
I-135	7.9150e+002	2.9286e+013	7.5401e+001	2.7899e+006
La-140	1.2620e+000	4.6694e+010	1.2022e-001	4.4483e+003
La-141	2.6720e-001	9.8864e+009	2.5455e-002	9.4182e+002
La-142	1.5160e-001	5.6092e+009	1.4442e-002	5.3435e+002
Mo-99	5.2870e+000	1.9562e+011	5.0366e-001	1.8635e+004
Nb-95	4.1040e-001	1.5185e+010	3.9096e-002	1.4466e+003
Nd-147	1.5440e-001	5.7128e+009	1.4709e-002	5.4422e+002

DOS File: SGTS2.MS5
Run Date: June 25, 2008
Run Time: 2:56:16 PM
Duration: 00:00:21

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	1.1060e+001	4.0922e+011	1.0536e+000	3.8984e+004
Pr-143	3.4530e-001	1.2776e+010	3.2895e-002	1.2171e+003
Pr-144	7.9664e-001	2.9476e+010	7.5891e-002	2.8080e+003
Pu-238	2.4360e-003	9.0132e+007	2.3206e-004	8.5863e+000
Pu-239	2.5870e-004	9.5719e+006	2.4645e-005	9.1186e-001
Pu-240	4.1600e-004	1.5392e+007	3.9630e-005	1.4663e+000
Pu-241	1.0260e-001	3.7962e+009	9.7741e-003	3.6164e+002
Rb-86	8.5590e-001	3.1668e+010	8.1536e-002	3.0168e+003
Rh-103m	4.5829e+000	1.6957e+011	4.3659e-001	1.6154e+004
Rh-105	2.9550e+000	1.0934e+011	2.8151e-001	1.0416e+004
Rh-106	1.8320e+000	6.7784e+010	1.7452e-001	6.4574e+003
Ru-103	4.5950e+000	1.7002e+011	4.3774e-001	1.6196e+004
Ru-105	2.3270e+000	8.6099e+010	2.2168e-001	8.2021e+003
Ru-106	1.8320e+000	6.7784e+010	1.7452e-001	6.4574e+003
Sb-127	4.9480e+000	1.8308e+011	4.7137e-001	1.7441e+004
Sb-129	1.3460e+001	4.9802e+011	1.2823e+000	4.7443e+004
Sr-89	2.1960e+001	8.1252e+011	2.0920e+000	7.7404e+004
Sr-90	2.8020e+000	1.0367e+011	2.6693e-001	9.8764e+003
Sr-91	2.4220e+001	8.9614e+011	2.3073e+000	8.5370e+004
Sr-92	1.7840e+001	6.6008e+011	1.6995e+000	6.2882e+004
Tc-99m	4.7730e+000	1.7660e+011	4.5470e-001	1.6824e+004
Te-127	4.9740e+000	1.8404e+011	4.7384e-001	1.7532e+004
Te-127m	8.4930e-001	3.1424e+010	8.0908e-002	2.9936e+003
Te-129	1.5490e+001	5.7313e+011	1.4756e+000	5.4599e+004
Te-129m	3.5570e+000	1.3161e+011	3.3885e-001	1.2538e+004
Te-131m	1.0970e+001	4.0589e+011	1.0450e+000	3.8667e+004
Te-132	8.0900e+001	2.9933e+012	7.7069e+000	2.8515e+005
Y-90	6.3620e-002	2.3539e+009	6.0607e-003	2.2425e+002
Y-91	2.9210e-001	1.0808e+010	2.7827e-002	1.0296e+003
Y-92	4.4740e+000	1.6554e+011	4.2621e-001	1.5770e+004
Y-93	1.9920e-001	7.3704e+009	1.8977e-002	7.0213e+002
Zr-95	4.1010e-001	1.5174e+010	3.9068e-002	1.4455e+003
Zr-97	3.7410e-001	1.3842e+010	3.5638e-002	1.3186e+003

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.927e+07	0.000e+00	5.512e-28	0.000e+00	4.728e-29
0.02	3.451e+10	0.000e+00	1.554e-24	0.000e+00	5.381e-26
0.03	4.098e+12	3.498e-105	4.080e-22	3.467e-107	4.044e-24
0.04	1.159e+11	1.199e-52	3.060e-23	5.304e-55	1.353e-25
0.05	3.935e+11	7.910e-33	3.396e-22	2.107e-35	9.047e-25
0.06	1.444e+11	1.211e-24	9.007e-22	2.405e-27	1.789e-24

DOS File: SGTS2.MS5
Run Date: June 25, 2008
Run Time: 2:56:16 PM
Duration: 00:00:21

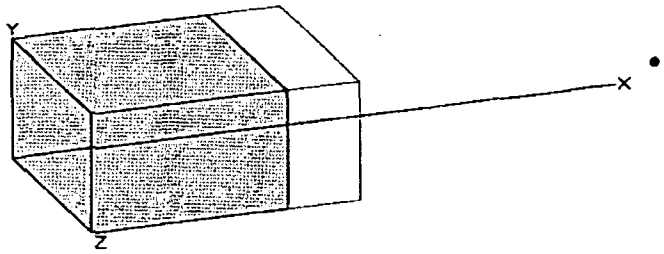
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	5.616e+11	7.333e-17	6.419e-15	1.160e-19	1.016e-17
0.1	4.508e+11	5.209e-14	1.021e-11	7.968e-17	1.561e-14
0.15	1.015e+12	1.500e-10	5.852e-08	2.469e-13	9.636e-11
0.2	3.875e+12	2.092e-08	9.163e-06	3.692e-11	1.617e-08
0.3	3.943e+12	1.727e-06	5.303e-04	3.277e-09	1.006e-06
0.4	1.815e+13	1.438e-04	2.799e-02	2.802e-07	5.453e-05
0.5	4.026e+13	2.736e-03	3.582e-01	5.371e-06	7.031e-04
0.6	3.515e+13	1.295e-02	1.208e+00	2.527e-05	2.357e-03
0.8	4.336e+13	2.058e-01	1.126e+01	3.914e-04	2.141e-02
1.0	2.366e+13	7.393e-01	2.701e+01	1.363e-03	4.978e-02
1.5	2.161e+13	1.603e+01	2.992e+02	2.696e-02	5.034e-01
2.0	4.551e+12	2.447e+01	3.065e+02	3.785e-02	4.740e-01
3.0	3.200e+09	1.883e-01	1.446e+00	2.555e-04	1.962e-03
4.0	1.472e+08	3.599e-02	2.047e-01	4.452e-05	2.532e-04
TOTALS:	2.014e+14	4.169e+01	6.473e+02	6.690e-02	1.054e+00

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

Page : 1
DOS File: SGTS4.MS5
Run Date: June 26, 2008
Run Time: 10:14:37 AM
Duration: 00:00:21

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

Case Title: SGTS Filter
Description: Time = 4 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	3.8150e-004	1.4116e+007	3.6343e-005	1.3447e+000
Ba-137m	3.4198e+002	1.2653e+013	3.2578e+001	1.2054e+006
Ba-139	3.9170e+001	1.4493e+012	3.7315e+000	1.3807e+005
Ba-140	2.9130e+002	1.0778e+013	2.7750e+001	1.0268e+006
Ce-141	6.7310e+000	2.4905e+011	6.4122e-001	2.3725e+004
Ce-143	5.7560e+000	2.1297e+011	5.4834e-001	2.0289e+004
Ce-144	5.6690e+000	2.0975e+011	5.4005e-001	1.9982e+004
Cm-242	9.9740e-002	3.6904e+009	9.5016e-003	3.5156e+002
Cm-244	5.8490e-003	2.1641e+008	5.5720e-004	2.0616e+001
Co-58	1.1100e-001	4.1070e+009	1.0574e-002	3.9125e+002
Co-60	5.9810e-002	2.2130e+009	5.6977e-003	2.1082e+002
Cs-134	4.8030e+002	1.7771e+013	4.5755e+001	1.6929e+006
Cs-136	1.5200e+002	5.6240e+012	1.4480e+001	5.3576e+005
Cs-137	3.6150e+002	1.3376e+013	3.4438e+001	1.2742e+006
I-131	2.7480e+003	1.0168e+014	2.6179e+002	9.6861e+006
I-132	1.9430e+003	7.1891e+013	1.8510e+002	6.8486e+006
I-133	5.0700e+003	1.8759e+014	4.8299e+002	1.7871e+007
I-134	2.7050e+002	1.0009e+013	2.5769e+001	9.5345e+005
I-135	3.6150e+003	1.3376e+014	3.4438e+002	1.2742e+007
La-140	1.7380e+001	6.4306e+011	1.6557e+000	6.1260e+004
La-141	1.3170e+000	4.8729e+010	1.2546e-001	4.6421e+003
La-142	4.3260e-001	1.6006e+010	4.1211e-002	1.5248e+003
Mo-99	3.6320e+001	1.3438e+012	3.4600e+000	1.2802e+005
Nb-95	2.8790e+000	1.0652e+011	2.7427e-001	1.0148e+004
Nd-147	1.0770e+000	3.9849e+010	1.0260e-001	3.7962e+003

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	7.5740e+001	2.8024e+012	7.2153e+000	2.6697e+005
Pr-143	2.4360e+000	9.0132e+010	2.3206e-001	8.5863e+003
Pr-144	5.5879e+000	2.0675e+011	5.3233e-001	1.9696e+004
Pu-238	1.7090e-002	6.3233e+008	1.6281e-003	6.0238e+001
Pu-239	1.8160e-003	6.7192e+007	1.7300e-004	6.4010e+000
Pu-240	2.9190e-003	1.0800e+008	2.7808e-004	1.0289e+001
Pu-241	7.1980e-001	2.6633e+010	6.8571e-002	2.5371e+003
Rb-86	4.5060e+000	1.6672e+011	4.2926e-001	1.5883e+004
Rh-103m	3.2105e+001	1.1879e+012	3.0585e+000	1.1316e+005
Rh-105	2.0470e+001	7.5739e+011	1.9501e+000	7.2152e+004
Rh-106	1.2850e+001	4.7545e+011	1.2241e+000	4.5293e+004
Ru-103	3.2190e+001	1.1910e+012	3.0665e+000	1.1346e+005
Ru-105	1.1950e+001	4.4215e+011	1.1384e+000	4.2121e+004
Ru-106	1.2850e+001	4.7545e+011	1.2241e+000	4.5293e+004
Sb-127	3.4190e+001	1.2650e+012	3.2571e+000	1.2051e+005
Sb-129	6.8530e+001	2.5356e+012	6.5284e+000	2.4155e+005
Sr-89	1.5390e+002	5.6943e+012	1.4661e+001	5.4246e+005
Sr-90	1.9660e+001	7.2742e+011	1.8729e+000	6.9297e+004
Sr-91	1.4680e+002	5.4316e+012	1.3985e+001	5.1744e+005
Sr-92	7.5020e+001	2.7757e+012	7.1467e+000	2.6443e+005
Tc-99m	3.3280e+001	1.2314e+012	3.1704e+000	1.1730e+005
Te-127	3.4800e+001	1.2876e+012	3.3152e+000	1.2266e+005
Te-127m	5.9590e+000	2.2048e+011	5.6768e-001	2.1004e+004
Te-129	8.7860e+001	3.2508e+012	8.3699e+000	3.0969e+005
Te-129m	2.4940e+001	9.2278e+011	2.3759e+000	8.7908e+004
Te-131m	7.3490e+001	2.7191e+012	7.0010e+000	2.5904e+005
Te-132	5.5760e+002	2.0631e+013	5.3119e+001	1.9654e+006
Y-90	8.1240e-001	3.0059e+010	7.7392e-002	2.8635e+003
Y-91	2.1050e+000	7.7885e+010	2.0053e-001	7.4196e+003
Y-92	4.8830e+001	1.8067e+012	4.6517e+000	1.7211e+005
Y-93	1.2180e+000	4.5066e+010	1.1603e-001	4.2932e+003
Zr-95	2.8740e+000	1.0634e+011	2.7379e-001	1.0130e+004
Zr-97	2.4180e+000	8.9466e+010	2.3035e-001	8.5229e+003

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.290e+08	0.000e+00	3.690e-27	0.000e+00	3.165e-28
0.02	2.395e+11	0.000e+00	1.078e-23	0.000e+00	3.735e-25
0.03	2.490e+13	2.125e-104	2.479e-21	2.106e-106	2.456e-23
0.04	6.632e+11	6.863e-52	1.751e-22	3.035e-54	7.743e-25
0.05	2.712e+12	5.452e-32	2.341e-21	1.452e-34	6.236e-24
0.06	7.762e+11	6.508e-24	4.842e-21	1.293e-26	9.617e-24

For Information Only
DOS File: SGTS4.MS5
Run Date: June 26, 2008
Run Time: 10:14:37 AM
Duration: 00:00:21

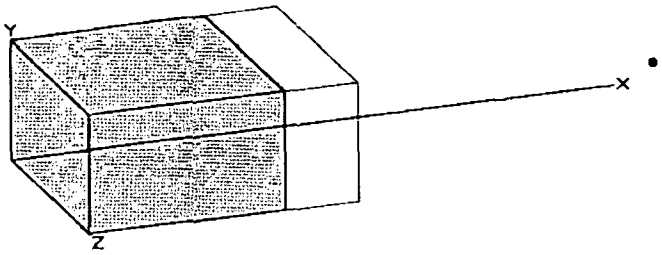
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	3.138e+12	4.098e-16	3.587e-14	6.485e-19	5.677e-17
0.1	3.078e+12	3.556e-13	6.969e-11	5.441e-16	1.066e-13
0.15	3.851e+12	5.692e-10	2.221e-07	9.373e-13	3.657e-10
0.2	2.342e+13	1.265e-07	5.539e-05	2.232e-10	9.776e-08
0.3	2.006e+13	8.790e-06	2.699e-03	1.667e-08	5.119e-06
0.4	9.449e+13	7.487e-04	1.457e-01	1.459e-06	2.839e-04
0.5	2.011e+14	1.367e-02	1.790e+00	2.684e-05	3.513e-03
0.6	1.413e+14	5.203e-02	4.853e+00	1.016e-04	9.472e-03
0.8	1.414e+14	6.707e-01	3.670e+01	1.276e-03	6.980e-02
1.0	9.555e+13	2.985e+00	1.090e+02	5.502e-03	2.010e-01
1.5	9.386e+13	6.959e+01	1.299e+03	1.171e-01	2.186e+00
2.0	1.806e+13	9.711e+01	1.216e+03	1.502e-01	1.881e+00
3.0	2.728e+10	1.606e+00	1.233e+01	2.178e-03	1.673e-02
4.0	4.202e+08	1.027e-01	5.840e-01	1.270e-04	7.225e-04
TOTALS:	8.686e+14	1.721e+02	2.681e+03	2.765e-01	4.368e+00

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

Page : 1
DOS File: SGTS8.MS5
Run Date: June 25, 2008
Run Time: 2:58:52 PM
Duration: 00:00:22

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

Case Title: SGTS Filter
Description: Time = 8 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	1.0450e-003	3.8665e+007	9.9551e-005	3.6834e+000
Ba-137m	8.8555e+002	3.2765e+013	8.4361e+001	3.1214e+006
Ba-139	1.4330e+001	5.3021e+011	1.3651e+000	5.0510e+004
Ba-140	7.8960e+002	2.9215e+013	7.5220e+001	2.7832e+006
Ce-141	1.8350e+001	6.7895e+011	1.7481e+000	6.4680e+004
Ce-143	1.4470e+001	5.3539e+011	1.3785e+000	5.1003e+004
Ce-144	1.5500e+001	5.7350e+011	1.4766e+000	5.4634e+004
Cm-242	2.7260e+001	1.0086e+012	2.5969e+000	9.6085e+004
Cm-244	1.6000e-002	5.9200e+008	1.5242e-003	5.6396e+001
Co-58	3.0300e-001	1.1211e+010	2.8865e-002	1.0680e+003
Co-60	1.6360e-001	6.0532e+009	1.5585e-002	5.7665e+002
Cs-134	1.2430e+003	4.5991e+013	1.1841e+002	4.3813e+006
Cs-136	3.9020e+002	1.4437e+013	3.7172e+001	1.3754e+006
Cs-137	9.3610e+002	3.4636e+013	8.9177e+001	3.2995e+006
I-131	7.7070e+003	2.8516e+014	7.3420e+002	2.7165e+007
I-132	2.7660e+003	1.0234e+014	2.6350e+002	9.7495e+006
I-133	1.2620e+004	4.6694e+014	1.2022e+003	4.4483e+007
I-134	3.2550e+001	1.2044e+012	3.1008e+000	1.1473e+005
I-135	6.7590e+003	2.5008e+014	6.4389e+002	2.3824e+007
La-140	9.6570e+001	3.5731e+012	9.1996e+000	3.4039e+005
La-141	1.7790e+000	6.5823e+010	1.6947e-001	6.2706e+003
La-142	1.9590e-001	7.2483e+009	1.8662e-002	6.9050e+002
Mo-99	9.5260e+001	3.5246e+012	9.0748e+000	3.3577e+005
Nb-95	7.8740e+000	2.9134e+011	7.5011e-001	2.7754e+004
Nd-147	2.9160e+000	1.0789e+011	2.7779e-001	1.0278e+004

DOS File: SGTS8.MS5
Run Date: June 25, 2008
Run Time: 2:58:52 PM
Duration: 00:00:22

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	1.9720e+002	7.2964e+012	1.8786e+001	6.9508e+005
Pr-143	6.7320e+000	2.4908e+011	6.4132e-001	2.3729e+004
Pr-144	1.5278e+001	5.6530e+011	1.4555e+000	5.3853e+004
Pu-238	4.6740e-002	1.7294e+009	4.4526e-003	1.6475e+002
Pu-239	4.9690e-003	1.8385e+008	4.7337e-004	1.7515e+001
Pu-240	7.9820e-003	2.9533e+008	7.6040e-004	2.8135e+001
Pu-241	1.9690e+000	7.2853e+010	1.8757e-001	6.9403e+003
Rb-86	1.1600e+001	4.2920e+011	1.1051e+000	4.0887e+004
Rh-103m	8.7549e+001	3.2393e+012	8.3403e+000	3.0859e+005
Rh-105	5.3600e+001	1.9832e+012	5.1062e+000	1.8893e+005
Rh-106	3.5130e+001	1.2998e+012	3.3466e+000	1.2383e+005
Ru-103	8.7780e+001	3.2479e+012	8.3623e+000	3.0940e+005
Ru-105	1.7500e+001	6.4750e+011	1.6671e+000	6.1683e+004
Ru-106	3.5130e+001	1.2998e+012	3.3466e+000	1.2383e+005
Sb-127	9.0750e+001	3.3578e+012	8.6452e+000	3.1987e+005
Sb-129	9.8650e+001	3.6501e+012	9.3978e+000	3.4772e+005
Sr-89	4.1990e+002	1.5536e+013	4.0001e+001	1.4801e+006
Sr-90	5.3770e+001	1.9895e+012	5.1223e+000	1.8953e+005
Sr-91	2.9990e+002	1.1096e+013	2.8570e+001	1.0571e+006
Sr-92	7.3760e+001	2.7291e+012	7.0267e+000	2.5999e+005
Tc-99m	8.9150e+001	3.2986e+012	8.4928e+000	3.1423e+005
Te-127	9.4310e+001	3.4895e+012	8.9843e+000	3.3242e+005
Te-127m	1.6300e+001	6.0310e+011	1.5528e+000	5.7454e+004
Te-129	1.5180e+002	5.6166e+012	1.4461e+001	5.3506e+005
Te-129m	6.8080e+001	2.5190e+012	6.4856e+000	2.3997e+005
Te-131m	1.8320e+002	6.7784e+012	1.7452e+001	6.4574e+005
Te-132	1.4720e+003	5.4464e+013	1.4023e+002	5.1885e+006
Y-90	4.3820e+000	1.6213e+011	4.1745e-001	1.5446e+004
Y-91	6.0280e+000	2.2304e+011	5.7425e-001	2.1247e+004
Y-92	1.2590e+002	4.6583e+012	1.1994e+001	4.4377e+005
Y-93	2.5320e+000	9.3684e+010	2.4121e-001	8.9247e+003
Zr-95	7.8460e+000	2.9030e+011	7.4744e-001	2.7655e+004
Zr-97	5.6130e+000	2.0768e+011	5.3472e-001	1.9785e+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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.253e+08	0.000e+00	9.308e-27	0.000e+00	7.984e-28
0.02	6.409e+11	0.000e+00	2.885e-23	0.000e+00	9.994e-25
0.03	6.461e+13	5.514e-104	6.432e-21	5.465e-106	6.375e-23
0.04	1.705e+12	1.764e-51	4.501e-22	7.802e-54	1.990e-24
0.05	7.161e+12	1.439e-31	6.180e-21	3.834e-34	1.646e-23
0.06	1.994e+12	1.672e-23	1.244e-20	3.322e-26	2.471e-23

DOS File: SGTS8.MS5
Run Date: June 25, 2008
Run Time: 2:58:52 PM
Duration: 00:00:22

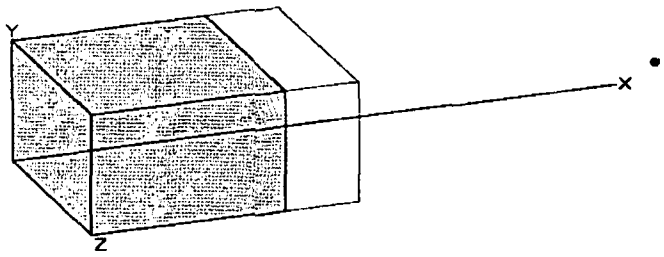
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	8.679e+12	1.133e-15	9.920e-14	1.793e-18	1.570e-16
0.1	8.013e+12	9.257e-13	1.814e-10	1.416e-15	2.775e-13
0.15	8.201e+12	1.212e-09	4.730e-07	1.996e-12	7.789e-10
0.2	5.860e+13	3.164e-07	1.386e-04	5.584e-10	2.446e-07
0.3	4.769e+13	2.089e-05	6.414e-03	3.963e-08	1.217e-05
0.4	2.521e+14	1.998e-03	3.887e-01	3.893e-06	7.574e-04
0.5	4.743e+14	3.224e-02	4.220e+00	6.327e-05	8.283e-03
0.6	2.501e+14	9.213e-02	8.593e+00	1.798e-04	1.677e-02
0.8	2.322e+14	1.102e+00	6.029e+01	2.096e-03	1.147e-01
1.0	1.702e+14	5.318e+00	1.943e+02	9.803e-03	3.581e-01
1.5	1.715e+14	1.271e+02	2.374e+03	2.139e-01	3.994e+00
2.0	3.137e+13	1.687e+02	2.113e+03	2.609e-01	3.268e+00
3.0	1.292e+11	7.604e+00	5.840e+01	1.032e-02	7.923e-02
4.0	1.903e+08	4.650e-02	2.645e-01	5.753e-05	3.272e-04
TOTALS:	1.789e+15	3.101e+02	4.813e+03	4.973e-01	7.840e+00

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

Page : 1
DOS File: SGTS16.MS5
Run Date: June 25, 2008
Run Time: 2:55:37 PM
Duration: 00:00:21

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

Case Title: SGTS Filter
Description: Time = 16 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.3
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	1.8470e-003	6.8339e+007	1.7595e-004	6.5102e+000
Ba-137m	1.5363e+003	5.6843e+013	1.4635e+002	5.4151e+006
Ba-139	4.5220e-001	1.6731e+010	4.3078e-002	1.5939e+003
Ba-140	1.3670e+003	5.0579e+013	1.3023e+002	4.8184e+006
Ce-141	3.2140e+001	1.1892e+012	3.0618e+000	1.1329e+005
Ce-143	2.1570e+001	7.9809e+011	2.0548e+000	7.6029e+004
Ce-144	2.7300e+001	1.0101e+012	2.6007e+000	9.6226e+004
Cm-242	4.7990e-001	1.7756e+010	4.5717e-002	1.6915e+003
Cm-244	2.8200e-002	1.0434e+009	2.6864e-003	9.9398e+001
Co-58	5.3240e-001	1.9699e+010	5.0719e-002	1.8766e+003
Co-60	2.8830e-001	1.0667e+010	2.7465e-002	1.0162e+003
Cs-134	2.1560e+003	7.9772e+013	2.0539e+002	7.5994e+006
Cs-136	6.6510e+002	2.4609e+013	6.3360e+001	2.3443e+006
Cs-137	1.6240e+003	6.0088e+013	1.5471e+002	5.7242e+006
I-131	1.5680e+004	5.8016e+014	1.4937e+003	5.5268e+007
I-132	3.0170e+003	1.1163e+014	2.8741e+002	1.0634e+007
I-133	2.0230e+004	7.4851e+014	1.9272e+003	7.1306e+007
I-134	1.2190e-001	4.5103e+009	1.1613e-002	4.2967e+002
I-135	6.1120e+003	2.2614e+014	5.8225e+002	2.1543e+007
La-140	3.2620e+002	1.2069e+013	3.1075e+001	1.1498e+006
La-141	7.6510e-001	2.8309e+010	7.2886e-002	2.6968e+003
La-142	9.4660e-003	3.5024e+008	9.0177e-004	3.3365e+001
Mo-99	1.5440e+002	5.7128e+012	1.4709e+001	5.4422e+005
Nb-95	1.3880e+001	5.1356e+011	1.3223e+000	4.8924e+004
Nd-147	5.0340e+000	1.8626e+011	4.7956e-001	1.7744e+004

DOS File: SGTS16.MS5
Run Date: June 25, 2008
Run Time: 2:55:37 PM
Duration: 00:00:21

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	3.1520e+002	1.1662e+013	3.0027e+001	1.1110e+006
Pr-143	1.2060e+001	4.4622e+011	1.1489e+000	4.2509e+004
Pr-144	2.6910e+001	9.9566e+011	2.5635e+000	9.4850e+004
Pu-238	8.2400e-002	3.0488e+009	7.8498e-003	2.9044e+002
Pu-239	8.7680e-003	3.2442e+008	8.3527e-004	3.0905e+001
Pu-240	1.4070e-002	5.2059e+008	1.3404e-003	4.9593e+001
Pu-241	3.4700e+000	1.2839e+011	3.3057e-001	1.2231e+004
Rb-86	1.9870e+001	7.3519e+011	1.8929e+000	7.0037e+004
Rh-103m	1.5350e+002	5.6793e+012	1.4623e+001	5.4104e+005
Rh-105	8.3300e+001	3.0821e+012	7.9355e+000	2.9361e+005
Rh-106	6.1900e+001	2.2903e+012	5.8968e+000	2.1818e+005
Ru-103	1.5390e+002	5.6943e+012	1.4661e+001	5.4246e+005
Ru-105	8.8470e+000	3.2734e+011	8.4280e-001	3.1184e+004
Ru-106	6.1900e+001	2.2903e+012	5.8968e+000	2.1818e+005
Sb-127	1.5070e+002	5.5759e+012	1.4356e+001	5.3118e+005
Sb-129	4.8180e+001	1.7827e+012	4.5898e+000	1.6982e+005
Sr-89	7.3690e+002	2.7265e+013	7.0200e+001	2.5974e+006
Sr-90	9.4790e+001	3.5072e+012	9.0301e+000	3.3411e+005
Sr-91	2.9500e+002	1.0915e+013	2.8103e+001	1.0398e+006
Sr-92	1.6800e+001	6.2160e+011	1.6004e+000	5.9216e+004
Tc-99m	1.5010e+002	5.5537e+012	1.4299e+001	5.2907e+005
Te-127	1.6260e+002	6.0162e+012	1.5490e+001	5.7313e+005
Te-127m	2.8730e+001	1.0630e+012	2.7369e+000	1.0127e+005
Te-129	1.6350e+002	6.0495e+012	1.5576e+001	5.7630e+005
Te-129m	1.1930e+002	4.4141e+012	1.1365e+001	4.2050e+005
Te-131m	2.6850e+002	9.9345e+012	2.5578e+001	9.4640e+005
Te-132	2.4170e+003	8.9429e+013	2.3025e+002	8.5194e+006
Y-90	1.4960e+001	5.5352e+011	1.4251e+000	5.2731e+004
Y-91	1.1250e+001	4.1625e+011	1.0717e+000	3.9654e+004
Y-92	8.1410e+001	3.0122e+012	7.7554e+000	2.8695e+005
Y-93	2.5780e+000	9.5386e+010	2.4559e-001	9.0869e+003
Zr-95	1.3780e+001	5.0986e+011	1.3127e+000	4.8571e+004
Zr-97	7.1270e+000	2.6370e+011	6.7895e-001	2.5121e+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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	5.087e+08	0.000e+00	1.455e-26	0.000e+00	1.248e-27
0.02	1.086e+12	0.000e+00	4.889e-23	0.000e+00	1.694e-24
0.03	1.106e+14	1.352e-103	1.101e-20	1.340e-105	1.091e-22
0.04	2.874e+12	4.248e-51	7.587e-22	1.879e-53	3.355e-24
0.05	1.176e+13	3.368e-31	1.015e-20	8.972e-34	2.703e-23
0.06	3.375e+12	4.024e-23	2.111e-20	7.992e-26	4.194e-23

DOS File: SGTS16.MS5
Run Date: June 25, 2008
Run Time: 2:55:37 PM
Duration: 00:00:21

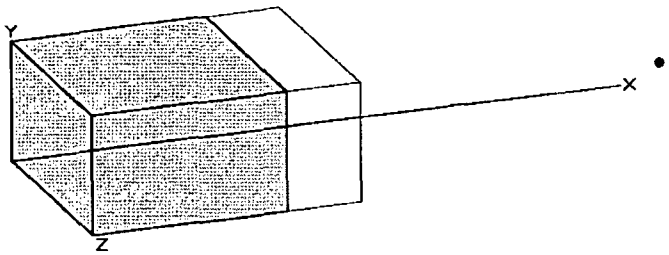
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	1.719e+13	3.182e-15	2.785e-13	5.036e-18	4.407e-16
0.1	1.284e+13	2.100e-12	4.111e-10	3.212e-15	6.289e-13
0.15	1.349e+13	2.817e-09	1.098e-06	4.639e-12	1.808e-09
0.2	9.236e+13	7.028e-07	3.073e-04	1.240e-09	5.423e-07
0.3	7.876e+13	4.848e-05	1.485e-02	9.195e-08	2.816e-05
0.4	4.935e+14	5.478e-03	1.063e+00	1.067e-05	2.071e-03
0.5	7.381e+14	7.008e-02	9.145e+00	1.376e-04	1.795e-02
0.6	3.508e+14	1.800e-01	1.673e+01	3.514e-04	3.266e-02
0.8	3.121e+14	2.053e+00	1.119e+02	3.906e-03	2.128e-01
1.0	1.811e+14	7.808e+00	2.839e+02	1.439e-02	5.232e-01
1.5	1.737e+14	1.758e+02	3.259e+03	2.957e-01	5.484e+00
2.0	2.911e+13	2.114e+02	2.625e+03	3.269e-01	4.059e+00
3.0	4.299e+11	3.349e+01	2.544e+02	4.544e-02	3.451e-01
4.0	9.194e+06	2.927e-03	1.644e-02	3.621e-06	2.033e-05
TOTALS:	2.623e+15	4.308e+02	6.562e+03	6.868e-01	1.068e+01

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

Page : 1
DOS File: SGTS24.MS5
Run Date: June 25, 2008
Run Time: 2:56:38 PM
Duration: 00:00:21

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

Case Title: SGTS Filter
Description: Time = 24 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	2.2040e-003	8.1548e+007	2.0996e-004	7.7686e+000
Ba-137m	1.8211e+003	6.7379e+013	1.7348e+002	6.4188e+006
Ba-139	9.6290e-003	3.5627e+008	9.1730e-004	3.3940e+001
Ba-140	1.5970e+003	5.9089e+013	1.5214e+002	5.6291e+006
Ce-141	3.7970e+001	1.4049e+012	3.6172e+000	1.3384e+005
Ce-143	2.1700e+001	8.0290e+011	2.0672e+000	7.6487e+004
Ce-144	3.2460e+001	1.2010e+012	3.0923e+000	1.1441e+005
Cm-242	5.7020e-001	2.1097e+010	5.4320e-002	2.0098e+003
Cm-244	3.3560e-002	1.2417e+009	3.1971e-003	1.1829e+002
Co-58	6.3150e-001	2.3366e+010	6.0159e-002	2.2259e+003
Co-60	3.4300e-001	1.2691e+010	3.2676e-002	1.2090e+003
Cs-134	2.5550e+003	9.4535e+013	2.4340e+002	9.0058e+006
Cs-136	7.7460e+002	2.8660e+013	7.3792e+001	2.7303e+006
Cs-137	1.9250e+003	7.1225e+013	1.8338e+002	6.7852e+006
I-131	2.7120e+004	1.0034e+015	2.5836e+003	9.5592e+007
I-132	3.2440e+003	1.2003e+014	3.0904e+002	1.1434e+007
I-133	2.2080e+004	8.1696e+014	2.1034e+003	7.7827e+007
I-134	3.1120e-004	1.1514e+007	2.9646e-005	1.0969e+000
I-135	3.7650e+003	1.3931e+014	3.5867e+002	1.3271e+007
La-140	5.4720e+002	2.0246e+013	5.2128e+001	1.9288e+006
La-141	2.2210e-001	8.2177e+009	2.1158e-002	7.8285e+002
La-142	3.0870e-004	1.1422e+007	2.9408e-005	1.0881e+000
Mo-99	1.6890e+002	6.2493e+012	1.6090e+001	5.9533e+005
Nb-95	1.6510e+001	6.1087e+011	1.5728e+000	5.8194e+004
Nd-147	5.8650e+000	2.1701e+011	5.5872e-001	2.0673e+004

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Run Date: June 25, 2008
Run Time: 2:56:38 PM
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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	3.4000e+002	1.2580e+013	3.2390e+001	1.1984e+006
Pr-143	1.4510e+001	5.3687e+011	1.3823e+000	5.1144e+004
Pr-144	3.1996e+001	1.1838e+012	3.0481e+000	1.1278e+005
Pu-238	9.8050e-002	3.6279e+009	9.3406e-003	3.4560e+002
Pu-239	1.0440e-002	3.8628e+008	9.9456e-004	3.6799e+001
Pu-240	1.6750e-002	6.1975e+008	1.5957e-003	5.9040e+001
Pu-241	4.1290e+000	1.5277e+011	3.9335e-001	1.4554e+004
Rb-86	2.3260e+001	8.6062e+011	2.2158e+000	8.1986e+004
Rh-103m	1.8152e+002	6.7163e+012	1.7292e+001	6.3982e+005
Rh-105	8.5600e+001	3.1672e+012	8.1546e+000	3.0172e+005
Rh-106	7.3610e+001	2.7236e+012	7.0124e+000	2.5946e+005
Ru-103	1.8200e+002	6.7340e+012	1.7338e+001	6.4151e+005
Ru-105	3.0200e+000	1.1174e+011	2.8770e-001	1.0645e+004
Ru-106	7.3610e+001	2.7236e+012	7.0124e+000	2.5946e+005
Sb-127	1.6880e+002	6.2456e+012	1.6081e+001	5.9498e+005
Sb-129	1.5880e+001	5.8756e+011	1.5128e+000	5.5973e+004
Sr-89	8.7290e+002	3.2297e+013	8.3156e+001	3.0768e+006
Sr-90	1.1280e+002	4.1736e+012	1.0746e+001	3.9759e+005
Sr-91	1.9580e+002	7.2446e+012	1.8653e+001	6.9015e+005
Sr-92	2.5840e+000	9.5608e+010	2.4616e-001	9.1080e+003
Tc-99m	1.6930e+002	6.2641e+012	1.6128e+001	5.9674e+005
Te-127	1.8850e+002	6.9745e+012	1.7957e+001	6.6442e+005
Te-127m	3.4180e+001	1.2647e+012	3.2561e+000	1.2048e+005
Te-129	1.4430e+002	5.3391e+012	1.3747e+001	5.0862e+005
Te-129m	1.4110e+002	5.2207e+012	1.3442e+001	4.9734e+005
Te-131m	2.6560e+002	9.8272e+012	2.5302e+001	9.3618e+005
Te-132	2.6790e+003	9.9123e+013	2.5521e+002	9.4429e+006
Y-90	2.5730e+001	9.5201e+011	2.4511e+000	9.0692e+004
Y-91	1.3770e+001	5.0949e+011	1.3118e+000	4.8536e+004
Y-92	2.5960e+001	9.6052e+011	2.4731e+000	9.1503e+004
Y-93	1.7710e+000	6.5527e+010	1.6871e-001	6.2424e+003
Zr-95	1.6340e+001	6.0458e+011	1.5566e+000	5.7595e+004
Zr-97	6.1080e+000	2.2600e+011	5.8187e-001	2.1529e+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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	5.606e+08	0.000e+00	1.604e-26	0.000e+00	1.376e-27
0.02	1.243e+12	0.000e+00	5.595e-23	0.000e+00	1.938e-24
0.03	1.400e+14	1.194e-103	1.393e-20	1.184e-105	1.381e-22
0.04	3.310e+12	3.425e-51	8.737e-22	1.515e-53	3.864e-24
0.05	1.303e+13	2.620e-31	1.125e-20	6.980e-34	2.997e-23
0.06	3.901e+12	3.271e-23	2.434e-20	6.497e-26	4.834e-23

DOS File: SGTS24.MS5
Run Date: June 25, 2008
Run Time: 2:56:38 PM
Duration: 00:00:21

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	2.852e+13	3.724e-15	3.260e-13	5.893e-18	5.159e-16
0.1	1.390e+13	1.606e-12	3.147e-10	2.457e-15	4.814e-13
0.15	1.544e+13	2.283e-09	8.907e-07	3.759e-12	1.467e-09
0.2	1.010e+14	5.453e-07	2.389e-04	9.624e-10	4.216e-07
0.3	1.086e+14	4.759e-05	1.461e-02	9.028e-08	2.772e-05
0.4	8.339e+14	6.607e-03	1.286e+00	1.287e-05	2.505e-03
0.5	8.029e+14	5.457e-02	7.144e+00	1.071e-04	1.402e-02
0.6	4.205e+14	1.549e-01	1.444e+01	3.023e-04	2.819e-02
0.8	3.456e+14	1.640e+00	8.972e+01	3.119e-03	1.707e-01
1.0	1.523e+14	4.758e+00	1.738e+02	8.770e-03	3.204e-01
1.5	1.371e+14	1.016e+02	1.898e+03	1.710e-01	3.193e+00
2.0	1.988e+13	1.069e+02	1.339e+03	1.653e-01	2.070e+00
3.0	7.209e+11	4.242e+01	3.258e+02	5.756e-02	4.421e-01
4.0	2.998e+05	7.328e-05	4.168e-04	9.065e-08	5.156e-07
TOTALS:	3.142e+15	2.576e+02	3.849e+03	4.062e-01	6.241e+00

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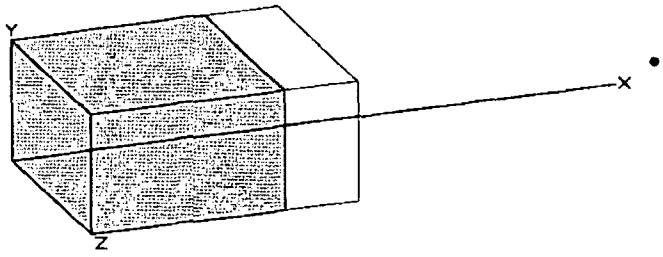
Page : 1
DOS File: SGTS48.MS5
Run Date: June 25, 2008
Run Time: 2:57:43 PM
Duration: 00:00:21

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

Case Title: SGTS Filter
Description: Time = 48 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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	uCi/cm³	Bq/cm³
Am-241	2.3020e-003	8.5174e+007	2.1930e-004	8.1140e+000
Ba-137m	1.8816e+003	6.9619e+013	1.7925e+002	6.6322e+006
Ba-139	5.7200e-008	2.1164e+003	5.4491e-009	2.0162e-004
Ba-140	1.5670e+003	5.7979e+013	1.4928e+002	5.5233e+006
Ce-141	3.8520e+001	1.4252e+012	3.6696e+000	1.3577e+005
Ce-143	1.3580e+001	5.0246e+011	1.2937e+000	4.7866e+004
Ce-144	3.3550e+001	1.2414e+012	3.1961e+000	1.1826e+005
Cm-242	5.8830e-001	2.1767e+010	5.6044e-002	2.0736e+003
Cm-244	3.4760e-002	1.2861e+009	3.3114e-003	1.2252e+002
Co-58	6.4790e-001	2.3972e+010	6.1722e-002	2.2837e+003
Co-60	3.5530e-001	1.3146e+010	3.3847e-002	1.2524e+003
Cs-134	2.6380e+003	9.7606e+013	2.5131e+002	9.2983e+006
Cs-136	7.5920e+002	2.8090e+013	7.2324e+001	2.6760e+006
Cs-137	1.9890e+003	7.3593e+013	1.8948e+002	7.0108e+006
I-131	3.0370e+004	1.1237e+015	2.8932e+003	1.0705e+008
I-132	2.7010e+003	9.9937e+013	2.5731e+002	9.5204e+006
I-133	1.5120e+004	5.5944e+014	1.4404e+003	5.3294e+007
I-134				
I-135	4.6310e+002	1.7135e+013	4.4117e+001	1.6323e+006
La-140	9.2390e+002	3.4184e+013	8.8014e+001	3.2565e+006
La-141	3.3380e-003	1.2351e+008	3.1799e-004	1.1766e+001
La-142	6.5820e-009	2.4353e+002	6.2703e-010	2.3200e-005
Mo-99	1.3600e+002	5.0320e+012	1.2956e+001	4.7937e+005
Nb-95	1.7100e+001	6.3270e+011	1.6290e+000	6.0274e+004
Nd-147	5.7050e+000	2.1109e+011	5.4348e-001	2.0109e+004

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Run Date: June 25, 2008
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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	2.6250e+002	9.7125e+012	2.5007e+001	9.2525e+005
Pr-143	1.5170e+001	5.6129e+011	1.4452e+000	5.3471e+004
Pr-144	3.3070e+001	1.2236e+012	3.1504e+000	1.1656e+005
Pu-238	1.0160e-001	3.7592e+009	9.6788e-003	3.5812e+002
Pu-239	1.0840e-002	4.0108e+008	1.0327e-003	3.8208e+001
Pu-240	1.7350e-002	6.4195e+008	1.6528e-003	6.1155e+001
Pu-241	4.2780e+000	1.5829e+011	4.0754e-001	1.5079e+004
Rb-86	2.3160e+001	8.5692e+011	2.2063e+000	8.1634e+004
Rh-103m	1.8481e+002	6.8381e+012	1.7606e+001	6.5142e+005
Rh-105	5.5680e+001	2.0602e+012	5.3043e+000	1.9626e+005
Rh-106	7.6130e+001	2.8168e+012	7.2524e+000	2.6834e+005
Ru-103	1.8530e+002	6.8561e+012	1.7652e+001	6.5314e+005
Ru-105	7.3280e-002	2.7114e+009	6.9809e-003	2.5830e+002
Ru-106	7.6130e+001	2.8168e+012	7.2524e+000	2.6834e+005
Sb-127	1.4610e+002	5.4057e+012	1.3918e+001	5.1497e+005
Sb-129	3.4990e-001	1.2946e+010	3.3333e-002	1.2333e+003
Sr-89	8.9210e+002	3.3008e+013	8.4985e+001	3.1444e+006
Sr-90	1.1690e+002	4.3253e+012	1.1136e+001	4.1205e+005
Sr-91	3.5210e+001	1.3028e+012	3.3542e+000	1.2411e+005
Sr-92	5.7770e-003	2.1375e+008	5.5034e-004	2.0363e+001
Tc-99m	1.3920e+002	5.1504e+012	1.3261e+001	4.9065e+005
Te-127	1.7320e+002	6.4084e+012	1.6500e+001	6.1049e+005
Te-127m	3.5370e+001	1.3087e+012	3.3695e+000	1.2467e+005
Te-129	1.2430e+002	4.5991e+012	1.1841e+001	4.3813e+005
Te-129m	1.4320e+002	5.2984e+012	1.3642e+001	5.0475e+005
Te-131m	1.5810e+002	5.8497e+012	1.5061e+001	5.5727e+005
Te-132	2.2440e+003	8.3028e+013	2.1377e+002	7.9096e+006
Y-90	4.7450e+001	1.7557e+012	4.5203e+000	1.6725e+005
Y-91	1.4570e+001	5.3909e+011	1.3880e+000	5.1356e+004
Y-92	3.1190e-001	1.1540e+010	2.9713e-002	1.0994e+003
Y-93	3.5350e-001	1.3080e+010	3.3676e-002	1.2460e+003
Zr-95	1.6750e+001	6.1975e+011	1.5957e+000	5.9040e+004
Zr-97	2.3650e+000	8.7505e+010	2.2530e-001	8.3361e+003

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	5.298e+08	0.000e+00	1.516e-26	0.000e+00	1.300e-27
0.02	1.129e+12	0.000e+00	5.082e-23	0.000e+00	1.760e-24
0.03	1.326e+14	1.131e-103	1.320e-20	1.121e-105	1.308e-22
0.04	3.174e+12	3.284e-51	8.379e-22	1.452e-53	3.706e-24
0.05	1.092e+13	2.195e-31	9.426e-21	5.848e-34	2.511e-23
0.06	3.751e+12	3.145e-23	2.340e-20	6.247e-26	4.648e-23

DOS File: SGTS48.MS5
Run Date: June 25, 2008
Run Time: 2:57:43 PM
Duration: 00:00:21

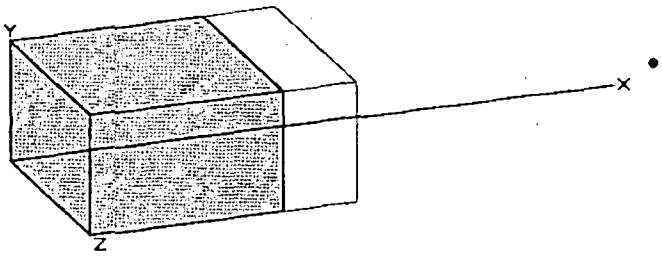
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	3.146e+13	4.108e-15	3.596e-13	6.501e-18	5.691e-16
0.1	1.092e+13	1.261e-12	2.472e-10	1.930e-15	3.781e-13
0.15	1.406e+13	2.079e-09	8.112e-07	3.423e-12	1.336e-09
0.2	8.345e+13	4.505e-07	1.973e-04	7.951e-10	3.483e-07
0.3	1.109e+14	4.860e-05	1.492e-02	9.220e-08	2.831e-05
0.4	9.233e+14	7.317e-03	1.424e+00	1.426e-05	2.774e-03
0.5	5.666e+14	3.851e-02	5.041e+00	7.559e-05	9.895e-03
0.6	4.039e+14	1.488e-01	1.388e+01	2.904e-04	2.708e-02
0.8	3.004e+14	1.425e+00	7.798e+01	2.711e-03	1.483e-01
1.0	8.678e+13	2.711e+00	9.903e+01	4.997e-03	1.825e-01
1.5	7.439e+13	5.516e+01	1.030e+03	9.280e-02	1.733e+00
2.0	5.712e+12	3.072e+01	3.848e+02	4.751e-02	5.950e-01
3.0	1.217e+12	7.163e+01	5.501e+02	9.718e-02	7.464e-01
4.0	6.393e+00	1.562e-09	8.886e-09	1.933e-12	1.099e-11
TOTALS:	2.765e+15	1.618e+02	2.162e+03	2.456e-01	3.445e+00

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

Page : 1
DOS File: SGTS96.MS5
Run Date: June 25, 2008
Run Time: 2:59:15 PM
Duration: 00:00:21

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

Case Title: SGTS Filter
Description: Time = 96 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	1.8090e-003	6.6933e+007	1.7233e-004	6.3763e+000
Ba-137m	1.4540e+003	5.3798e+013	1.3851e+002	5.1250e+006
Ba-139				
Ba-140	1.0870e+003	4.0219e+013	1.0355e+002	3.8314e+006
Ce-141	2.8530e+001	1.0556e+012	2.7179e+000	1.0056e+005
Ce-143	3.8300e+000	1.4171e+011	3.6486e-001	1.3500e+004
Ce-144	2.5810e+001	9.5497e+011	2.4588e+000	9.0974e+004
Cm-242	4.5090e-001	1.6683e+010	4.2955e-002	1.5893e+003
Cm-244	2.6870e-002	9.9419e+008	2.5597e-003	9.4711e+001
Co-58	4.9110e-001	1.8171e+010	4.6784e-002	1.7310e+003
Co-60	2.7440e-001	1.0153e+010	2.6140e-002	9.6720e+002
Cs-134	2.0350e+003	7.5295e+013	1.9386e+002	7.1729e+006
Cs-136	5.2770e+002	1.9525e+013	5.0271e+001	1.8600e+006
Cs-137	1.5370e+003	5.6869e+013	1.4642e+002	5.4176e+006
I-131	3.4280e+004	1.2684e+015	3.2657e+003	1.2083e+008
I-132	1.3670e+003	5.0579e+013	1.3023e+002	4.8184e+006
I-133	4.0960e+003	1.5155e+014	3.9020e+002	1.4437e+007
I-134				
I-135	4.0460e+000	1.4970e+011	3.8544e-001	1.4261e+004
La-140	9.5890e+002	3.5479e+013	9.1349e+001	3.3799e+006
La-141	5.4330e-007	2.0102e+004	5.1757e-008	1.9150e-003
La-142				
Mo-99	6.3510e+001	2.3499e+012	6.0502e+000	2.2386e+005
Nb-95	1.3200e+001	4.8840e+011	1.2575e+000	4.6527e+004
Nd-147	3.8870e+000	1.4382e+011	3.7029e-001	1.3701e+004

DOS File: SGTS96.MS5
Run Date: June 25, 2008
Run Time: 2:59:15 PM
Duration: 00:00:21

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	1.1260e+002	4.1662e+012	1.0727e+001	3.9689e+005
Pr-143	1.1220e+001	4.1514e+011	1.0689e+000	3.9548e+004
Pr-144	2.5441e+001	9.4131e+011	2.4236e+000	8.9673e+004
Pu-238	7.8560e-002	2.9067e+009	7.4839e-003	2.7691e+002
Pu-239	8.4070e-003	3.1106e+008	8.0088e-004	2.9633e+001
Pu-240	1.3410e-002	4.9617e+008	1.2775e-003	4.7267e+001
Pu-241	3.3060e+000	1.2232e+011	3.1494e-001	1.1653e+004
Rb-86	1.6620e+001	6.1494e+011	1.5833e+000	5.8582e+004
Rh-103m	1.3794e+002	5.1036e+012	1.3140e+001	4.8619e+005
Rh-105	1.6800e+001	6.2160e+011	1.6004e+000	5.9216e+004
Rh-106	5.8620e+001	2.1689e+012	5.5844e+000	2.0662e+005
Ru-103	1.3830e+002	5.1171e+012	1.3175e+001	4.8748e+005
Ru-105	3.1770e-005	1.1755e+006	3.0265e-006	1.1198e-001
Ru-106	5.8620e+001	2.1689e+012	5.5844e+000	2.0662e+005
Sb-127	7.8800e+001	2.9156e+012	7.5068e+000	2.7775e+005
Sb-129	1.2230e-004	4.5251e+006	1.1651e-005	4.3108e-001
Sr-89	6.7090e+002	2.4823e+013	6.3913e+001	2.3648e+006
Sr-90	9.0310e+001	3.3415e+012	8.6033e+000	3.1832e+005
Sr-91	8.2010e-001	3.0344e+010	7.8126e-002	2.8907e+003
Sr-92	2.0800e-008	7.6960e+002	1.9815e-009	7.3315e-005
Tc-99m	6.5120e+001	2.4094e+012	6.2036e+000	2.2953e+005
Te-127	1.0230e+002	3.7851e+012	9.7455e+000	3.6058e+005
Te-127m	2.7210e+001	1.0068e+012	2.5921e+000	9.5909e+004
Te-129	9.1860e+001	3.3988e+012	8.7510e+000	3.2379e+005
Te-129m	1.0620e+002	3.9294e+012	1.0117e+001	3.7433e+005
Te-131m	4.0300e+001	1.4911e+012	3.8391e+000	1.4205e+005
Te-132	1.1340e+003	4.1958e+013	1.0803e+002	3.9971e+006
Y-90	5.8620e+001	2.1689e+012	5.5844e+000	2.0662e+005
Y-91	1.1070e+001	4.0959e+011	1.0546e+000	3.9019e+004
Y-92	2.1230e-005	7.8551e+005	2.0225e-006	7.4831e-002
Y-93	1.0140e-002	3.7518e+008	9.6598e-004	3.5741e+001
Zr-95	1.2670e+001	4.6879e+011	1.2070e+000	4.4659e+004
Zr-97	2.5530e-001	9.4461e+009	2.4321e-002	8.9987e+002

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.999e+08	0.000e+00	1.144e-26	0.000e+00	9.814e-28
0.02	6.899e+11	0.000e+00	3.106e-23	0.000e+00	1.076e-24
0.03	1.037e+14	8.851e-104	1.033e-20	8.772e-106	1.023e-22
0.04	2.208e+12	2.285e-51	5.830e-22	1.011e-53	2.579e-24
0.05	5.525e+12	1.111e-31	4.768e-21	2.958e-34	1.270e-23
0.06	2.543e+12	2.132e-23	1.586e-20	4.235e-26	3.151e-23

DOS File: SGTS96.MS5
Run Date: June 25, 2008
Run Time: 2:59:15 PM
Duration: 00:00:21

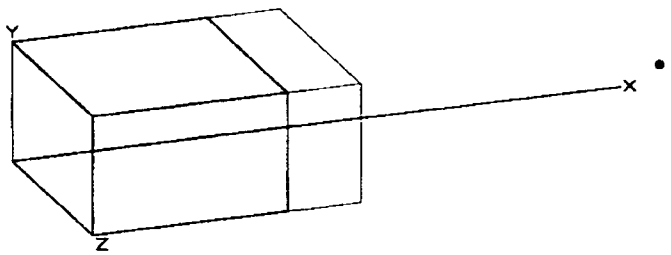
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	3.452e+13	4.507e-15	3.945e-13	7.132e-18	6.243e-16
0.1	4.939e+12	5.706e-13	1.118e-10	8.730e-16	1.711e-13
0.15	8.595e+12	1.270e-09	4.957e-07	2.092e-12	8.164e-10
0.2	4.430e+13	2.392e-07	1.048e-04	4.221e-10	1.849e-07
0.3	1.079e+14	4.728e-05	1.452e-02	8.969e-08	2.754e-05
0.4	1.035e+15	8.202e-03	1.596e+00	1.598e-05	3.110e-03
0.5	1.851e+14	1.258e-02	1.647e+00	2.469e-05	3.232e-03
0.6	3.033e+14	1.117e-01	1.042e+01	2.181e-04	2.034e-02
0.8	1.883e+14	8.935e-01	4.888e+01	1.699e-03	9.298e-02
1.0	4.455e+13	1.392e+00	5.084e+01	2.565e-03	9.371e-02
1.5	4.788e+13	3.550e+01	6.628e+02	5.973e-02	1.115e+00
2.0	2.049e+12	1.102e+01	1.380e+02	1.704e-02	2.135e-01
3.0	1.263e+12	7.434e+01	5.710e+02	1.009e-01	7.746e-01
TOTALS:	2.122e+15	1.233e+02	1.485e+03	1.822e-01	2.317e+00

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

Page : 1
DOS File: SGTS240.MS5
Run Date: June 26, 2008
Run Time: 2:22:07 PM
Duration: 00:00:20

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

Case Title: SGTS Filter
Description: Time = 240 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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	uCi/cm³	Bq/cm³
Am-241	8.0450e-004	2.9767e+007	7.6640e-005	2.8357e+000
Ba-137m	6.1660e+002	2.2814e+013	5.8740e+001	2.1734e+006
Ba-139				
Ba-140	3.3270e+002	1.2310e+013	3.1694e+001	1.1727e+006
Ce-141	1.0650e+001	3.9405e+011	1.0146e+000	3.7539e+004
Ce-143	7.8950e-002	2.9212e+009	7.5211e-003	2.7828e+002
Ce-144	1.0790e+001	3.9923e+011	1.0279e+000	3.8032e+004
Cm-242	1.8650e-001	6.9005e+009	1.7767e-002	6.5737e+002
Cm-244	1.1390e-002	4.2143e+008	1.0851e-003	4.0147e+001
Co-58	1.9650e-001	7.2705e+009	1.8719e-002	6.9262e+002
Co-60	1.1620e-001	4.2994e+009	1.1070e-002	4.0958e+002
Cs-134	8.5860e+002	3.1768e+013	8.1794e+001	3.0264e+006
Cs-136	1.6300e+002	6.0310e+012	1.5528e+001	5.7454e+005
Cs-137	6.5180e+002	2.4117e+013	6.2093e+001	2.2974e+006
I-131	2.7540e+004	1.0190e+015	2.6236e+003	9.7072e+007
I-132	1.6340e+002	6.0458e+012	1.5566e+001	5.7595e+005
I-133	4.5490e+001	1.6831e+012	4.3336e+000	1.6034e+005
I-134				
I-135	1.5090e-006	5.5833e+004	1.4375e-007	5.3189e-003
La-140	3.7570e+002	1.3901e+013	3.5791e+001	1.3243e+006
La-141				
La-142				
Mo-99	5.9410e+000	2.1982e+011	5.6596e-001	2.0941e+004
Nb-95	5.5520e+000	2.0542e+011	5.2891e-001	1.9570e+004
Nd-147	1.1290e+000	4.1773e+010	1.0755e-001	3.9795e+003

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	8.1740e+000	3.0244e+011	7.7869e-001	2.8811e+004
Pr-143	3.3610e+000	1.2436e+011	3.2018e-001	1.1847e+004
Pr-144	1.0636e+001	3.9352e+011	1.0132e+000	3.7488e+004
Pu-238	3.3600e-002	1.2432e+009	3.2009e-003	1.1843e+002
Pu-239	3.5780e-003	1.3239e+008	3.4085e-004	1.2612e+001
Pu-240	5.6920e-003	2.1060e+008	5.4224e-004	2.0063e+001
Pu-241	1.4020e+000	5.1874e+010	1.3356e-001	4.9417e+003
Rb-86	5.6410e+000	2.0872e+011	5.3738e-001	1.9883e+004
Rh-103m	5.2641e+001	1.9477e+012	5.0148e+000	1.8555e+005
Rh-105	4.2380e-001	1.5681e+010	4.0373e-002	1.4938e+003
Rh-106	2.4600e+001	9.1020e+011	2.3435e+000	8.6709e+004
Ru-103	5.2780e+001	1.9529e+012	5.0280e+000	1.8604e+005
Ru-105				
Ru-106	2.4600e+001	9.1020e+011	2.3435e+000	8.6709e+004
Sb-127	1.1350e+001	4.1995e+011	1.0812e+000	4.0006e+004
Sb-129				
Sr-89	2.6220e+002	9.7014e+012	2.4978e+001	9.2419e+005
Sr-90	3.8310e+001	1.4175e+012	3.6496e+000	1.3503e+005
Sr-91	9.5200e-006	3.5224e+005	9.0691e-007	3.3556e-002
Sr-92				
Tc-99m	6.0910e+000	2.2537e+011	5.8025e-001	2.1469e+004
Te-127	2.2220e+001	8.2214e+011	2.1168e+000	7.8320e+004
Te-127m	1.1250e+001	4.1625e+011	1.0717e+000	3.9654e+004
Te-129	3.4440e+001	1.2743e+012	3.2809e+000	1.2139e+005
Te-129m	3.9830e+001	1.4737e+012	3.7944e+000	1.4039e+005
Te-131m	6.1400e-001	2.2718e+010	5.8492e-002	2.1642e+003
Te-132	1.3420e+002	4.9654e+012	1.2784e+001	4.7302e+005
Y-90	3.5660e+001	1.3194e+012	3.3971e+000	1.2569e+005
Y-91	4.3770e+000	1.6195e+011	4.1697e-001	1.5428e+004
Y-92				
Y-93	2.1970e-007	8.1289e+003	2.0930e-008	7.7439e-004
Zr-95	5.0380e+000	1.8641e+011	4.7994e-001	1.7758e+004
Zr-97	2.9500e-004	1.0915e+007	2.8103e-005	1.0398e+000

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.681e+08	0.000e+00	4.808e-27	0.000e+00	4.124e-28
0.02	1.903e+11	0.000e+00	8.567e-24	0.000e+00	2.968e-25
0.03	5.676e+13	4.844e-104	5.650e-21	4.800e-106	5.600e-23
0.04	7.798e+11	8.069e-52	2.059e-22	3.569e-54	9.105e-25
0.05	6.587e+11	1.324e-32	5.684e-22	3.527e-35	1.514e-24
0.06	7.634e+11	6.401e-24	4.762e-21	1.271e-26	9.459e-24

For Information Only
DOS File: SGTS240.MS5
Run Date: June 26, 2008
Run Time: 2:22:07 PM
Duration: 00:00:20

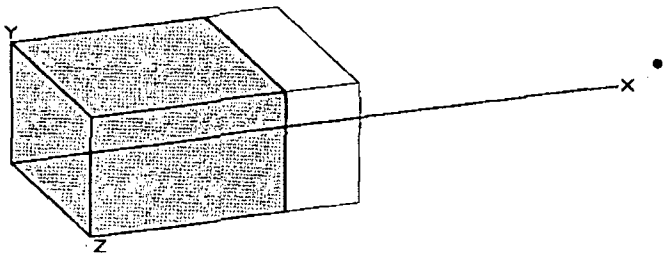
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	2.707e+13	3.534e-15	3.094e-13	5.593e-18	4.896e-16
0.1	4.821e+11	5.570e-14	1.091e-11	8.521e-17	1.670e-14
0.15	2.176e+12	3.217e-10	1.255e-07	5.297e-13	2.067e-10
0.2	8.054e+12	4.348e-08	1.905e-05	7.674e-11	3.361e-08
0.3	7.407e+13	3.245e-05	9.963e-03	6.156e-08	1.890e-05
0.4	8.283e+14	6.563e-03	1.277e+00	1.279e-05	2.488e-03
0.5	1.878e+13	1.276e-03	1.671e-01	2.505e-06	3.279e-04
0.6	1.435e+14	5.287e-02	4.931e+00	1.032e-04	9.625e-03
0.8	6.538e+13	3.102e-01	1.697e+01	5.901e-04	3.228e-02
1.0	1.027e+13	3.209e-01	1.172e+01	5.915e-04	2.161e-02
1.5	1.523e+13	1.129e+01	2.108e+02	1.900e-02	3.547e-01
2.0	3.210e+11	1.726e+00	2.162e+01	2.669e-03	3.343e-02
3.0	4.950e+11	2.913e+01	2.237e+02	3.952e-02	3.035e-01
TOTALS:	1.253e+15	4.284e+01	4.912e+02	6.249e-02	7.580e-01

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

Page : 1
DOS File: SGTS480.MS5
Run Date: June 25, 2008
Run Time: 2:58:05 PM
Duration: 00:00:21

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

Case Title: SGTS Filter
Description: Time = 480 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	2.1050e-004	7.7885e+006	2.0053e-005	7.4196e-001
Ba-137m	1.4966e+002	5.5373e+012	1.4257e+001	5.2751e+005
Ba-139				
Ba-140	4.6930e+001	1.7364e+012	4.4707e+000	1.6542e+005
Ce-141	2.0920e+000	7.7404e+010	1.9929e-001	7.3738e+003
Ce-143	1.2410e-004	4.5917e+006	1.1822e-005	4.3742e-001
Ce-144	2.5600e+000	9.4720e+010	2.4388e-001	9.0234e+003
Cm-242	4.3440e-002	1.6073e+009	4.1383e-003	1.5312e+002
Cm-244	2.7660e-003	1.0234e+008	2.6350e-004	9.7495e+000
Co-58	4.3310e-002	1.6025e+009	4.1259e-003	1.5266e+002
Co-60	2.8140e-002	1.0412e+009	2.6807e-003	9.9187e+001
Cs-134	2.0660e+002	7.6442e+012	1.9682e+001	7.2822e+005
Cs-136	2.3320e+001	8.6284e+011	2.2216e+000	8.2198e+004
Cs-137	1.5820e+002	5.8534e+012	1.5071e+001	5.5762e+005
I-131	1.2150e+004	4.4955e+014	1.1575e+003	4.2826e+007
I-132	4.9260e+000	1.8226e+011	4.6927e-001	1.7363e+004
I-133	1.5980e-002	5.9126e+008	1.5223e-003	5.6326e+001
I-134				
I-135				
La-140	5.4470e+001	2.0154e+012	5.1890e+000	1.9199e+005
La-141				
La-142				
Mo-99	1.1610e-001	4.2957e+009	1.1060e-002	4.0923e+002
Nb-95	1.3130e+000	4.8581e+010	1.2508e-001	4.6280e+003
Nd-147	1.4600e-001	5.4020e+009	1.3909e-002	5.1462e+002

DOS File: SGTS480.MS5
Run Date: June 25, 2008
Run Time: 2:58:05 PM
Duration: 00:00:21

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	1.0470e-001	3.8739e+009	9.9741e-003	3.6904e+002
Pr-143	5.3050e-001	1.9629e+010	5.0538e-002	1.8699e+003
Pr-144	2.5234e+000	9.3366e+010	2.4039e-001	8.8944e+003
Pu-238	8.1140e-003	3.0022e+008	7.7297e-004	2.8600e+001
Pu-239	8.7010e-004	3.2194e+007	8.2889e-005	3.0669e+000
Pu-240	1.3830e-003	5.1171e+007	1.3175e-004	4.8748e+000
Pu-241	3.4020e-001	1.2587e+010	3.2409e-002	1.1991e+003
Rb-86	9.4480e-001	3.4958e+010	9.0005e-002	3.3302e+003
Rh-103m	1.0722e+001	3.9670e+011	1.0214e+000	3.7792e+004
Rh-105	9.3240e-004	3.4499e+007	8.8824e-005	3.2865e+000
Rh-106	5.8660e+000	2.1704e+011	5.5882e-001	2.0676e+004
Ru-103	1.0750e+001	3.9775e+011	1.0241e+000	3.7891e+004
Ru-105				
Ru-106	5.8660e+000	2.1704e+011	5.5882e-001	2.0676e+004
Sb-127	4.5590e-001	1.6868e+010	4.3431e-002	1.6069e+003
Sb-129				
Sr-89	5.5550e+001	2.0554e+012	5.2919e+000	1.9580e+005
Sr-90	9.3040e+000	3.4425e+011	8.8634e-001	3.2794e+004
Sr-91				
Sr-92				
Tc-99m	1.1900e-001	4.4030e+009	1.1336e-002	4.1945e+002
Te-127	3.0640e+000	1.1337e+011	2.9189e-001	1.0800e+004
Te-127m	2.5800e+000	9.5460e+010	2.4578e-001	9.0939e+003
Te-129	6.8100e+000	2.5197e+011	6.4875e-001	2.4004e+004
Te-129m	7.8760e+000	2.9141e+011	7.5030e-001	2.7761e+004
Te-131m	5.8290e-004	2.1567e+007	5.5529e-005	2.0546e+000
Te-132	3.8870e+000	1.4382e+011	3.7029e-001	1.3701e+004
Y-90	9.3050e+000	3.4429e+011	8.8643e-001	3.2798e+004
Y-91	9.4490e-001	3.4961e+010	9.0015e-002	3.3306e+003
Y-92				
Y-93				
Zr-95	1.0990e+000	4.0663e+010	1.0470e-001	3.8737e+003
Zr-97	3.8060e-009	1.4082e+002	3.6257e-010	1.3415e-005

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.975e+07	0.000e+00	1.137e-27	0.000e+00	9.754e-29
0.02	3.443e+10	0.000e+00	1.550e-24	0.000e+00	5.369e-26
0.03	2.232e+13	1.905e-104	2.222e-21	1.888e-106	2.203e-23
0.04	1.539e+11	1.593e-52	4.063e-23	7.044e-55	1.797e-25
0.05	2.035e+10	4.090e-34	1.756e-23	1.090e-36	4.678e-26
0.06	1.083e+11	9.081e-25	6.756e-22	1.804e-27	1.342e-24

DOS File: SGTS480.MS5
Run Date: June 25, 2008
Run Time: 2:58:05 PM
Duration: 00:00:21

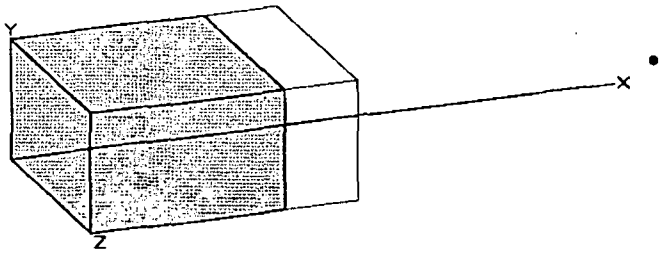
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	1.183e+13	1.544e-15	1.352e-13	2.444e-18	2.139e-16
0.1	1.882e+10	2.174e-15	4.260e-13	3.326e-18	6.518e-16
0.15	2.962e+11	4.378e-11	1.708e-08	7.209e-14	2.813e-11
0.2	1.449e+12	7.825e-09	3.428e-06	1.381e-11	6.050e-09
0.3	3.042e+13	1.333e-05	4.092e-03	2.528e-08	7.761e-06
0.4	3.650e+14	2.892e-03	5.628e-01	5.636e-06	1.097e-03
0.5	3.574e+12	2.429e-04	3.180e-02	4.768e-07	6.242e-05
0.6	4.819e+13	1.775e-02	1.656e+00	3.465e-05	3.231e-03
0.8	1.711e+13	8.118e-02	4.442e+00	1.544e-04	8.448e-03
1.0	1.355e+12	4.234e-02	1.547e+00	7.804e-05	2.851e-03
1.5	2.188e+12	1.622e+00	3.029e+01	2.730e-03	5.096e-02
2.0	2.386e+10	1.283e-01	1.607e+00	1.985e-04	2.486e-03
3.0	7.176e+10	4.223e+00	3.243e+01	5.729e-03	4.400e-02
TOTALS:	5.042e+14	6.118e+00	7.257e+01	8.931e-03	1.131e-01

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

Page : 1
DOS File: SGTS720.MS5
Run Date: June 25, 2008
Run Time: 2:58:27 PM
Duration: 00:00:25

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

Case Title: SGTS Filter
Description: Time = 720 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	5.7560e-005	2.1297e+006	5.4834e-006	2.0289e-001
Ba-137m	3.8105e+001	1.4099e+012	3.6300e+000	1.3431e+005
Ba-139				
Ba-140	6.9560e+000	2.5737e+011	6.6266e-001	2.4518e+004
Ce-141	4.3160e-001	1.5969e+010	4.1116e-002	1.5213e+003
Ce-143	2.0490e-007	7.5813e+003	1.9520e-008	7.2223e-004
Ce-144	6.3790e-001	2.3602e+010	6.0769e-002	2.2484e+003
Cm-242	1.0630e-002	3.9331e+008	1.0127e-003	3.7468e+001
Cm-244	7.0570e-004	2.6111e+007	6.7228e-005	2.4874e+000
Co-58	1.0030e-002	3.7111e+008	9.5550e-004	3.5353e+001
Co-60	7.1610e-003	2.6496e+008	6.8219e-004	2.5241e+001
Cs-134	5.2160e+001	1.9299e+012	4.9690e+000	1.8385e+005
Cs-136	3.5010e+000	1.2954e+011	3.3352e-001	1.2340e+004
Cs-137	4.0280e+001	1.4904e+012	3.8372e+000	1.4198e+005
I-131	4.7600e+003	1.7612e+014	4.5346e+002	1.6778e+007
I-132	1.6670e-001	6.1679e+009	1.5881e-002	5.8758e+002
I-133	4.9850e-006	1.8445e+005	4.7489e-007	1.7571e-002
I-134				
I-135				
La-140	8.0800e+000	2.9896e+011	7.6973e-001	2.8480e+004
La-141				
La-142				
Mo-99	2.3840e-003	8.8208e+007	2.2711e-004	8.4030e+000
Nb-95	3.2240e-001	1.1929e+010	3.0713e-002	1.1364e+003
Nd-147	1.9830e-002	7.3371e+008	1.8891e-003	6.9896e+001

DOS File: SGTS720.MS5
Run Date: June 25, 2008
Run Time: 2:58:27 PM
Duration: 00:00:25

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	1.4080e-003	5.2096e+007	1.3413e-004	4.9629e+000
Pr-143	8.1260e-002	3.0066e+009	7.7412e-003	2.8642e+002
Pr-144	6.2878e-001	2.3265e+010	5.9900e-002	2.2163e+003
Pu-238	2.0740e-003	7.6738e+007	1.9758e-004	7.3104e+000
Pu-239	2.2220e-004	8.2214e+006	2.1168e-005	7.8320e-001
Pu-240	3.5320e-004	1.3068e+007	3.3647e-005	1.2449e+000
Pu-241	8.6780e-002	3.2109e+009	8.2670e-003	3.0588e+002
Rb-86	1.6610e-001	6.1457e+009	1.5823e-002	5.8546e+002
Rh-103m	2.2949e+000	8.4913e+010	2.1863e-001	8.0892e+003
Rh-105	2.1560e-006	7.9772e+004	2.0539e-007	7.5994e-003
Rh-106	1.4700e+000	5.4390e+010	1.4004e-001	5.1814e+003
Ru-103	2.3010e+000	8.5137e+010	2.1920e-001	8.1105e+003
Ru-105				
Ru-106	1.4700e+000	5.4390e+010	1.4004e-001	5.1814e+003
Sb-127	1.9240e-002	7.1188e+008	1.8329e-003	6.7817e+001
Sb-129				
Sr-89	1.2370e+001	4.5769e+011	1.1784e+000	4.3601e+004
Sr-90	2.3750e+000	8.7875e+010	2.2625e-001	8.3713e+003
Sr-91				
Sr-92				
Tc-99m	2.4430e-003	9.0391e+007	2.3273e-004	8.6110e+000
Te-127	6.4980e-001	2.4043e+010	6.1903e-002	2.2904e+003
Te-127m	6.1900e-001	2.2903e+010	5.8968e-002	2.1818e+003
Te-129	1.4150e+000	5.2355e+010	1.3480e-001	4.9875e+003
Te-129m	1.6360e+000	6.0532e+010	1.5585e-001	5.7665e+003
Te-131m	5.8150e-007	2.1516e+004	5.5396e-008	2.0497e-003
Te-132	1.1830e-001	4.3771e+009	1.1270e-002	4.1698e+002
Y-90	2.3870e+000	8.8319e+010	2.2740e-001	8.4136e+003
Y-91	2.1430e-001	7.9291e+009	2.0415e-002	7.5536e+002
Y-92				
Y-93				
Zr-95	2.5180e-001	9.3166e+009	2.3987e-002	8.8754e+002
Zr-97				

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	9.759e+06	0.000e+00	2.792e-28	0.000e+00	2.395e-29
0.02	7.282e+09	0.000e+00	3.278e-25	0.000e+00	1.136e-26
0.03	8.531e+12	7.281e-105	8.493e-22	7.216e-107	8.417e-24
0.04	3.382e+10	3.499e-53	8.927e-24	1.548e-55	3.948e-26
0.05	8.919e+08	1.793e-35	7.697e-25	4.776e-38	2.050e-27
0.06	1.627e+10	1.365e-25	1.015e-22	2.710e-28	2.016e-25

DOS File: SGTS720.MS5
Run Date: June 25, 2008
Run Time: 2:58:27 PM
Duration: 00:00:25

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	4.620e+12	6.032e-16	5.280e-14	9.546e-19	8.356e-17
0.1	1.785e+09	2.062e-16	4.041e-14	3.155e-19	6.182e-17
0.15	4.675e+10	6.911e-12	2.697e-09	1.138e-14	4.441e-12
0.2	4.900e+11	2.645e-09	1.159e-06	4.669e-12	2.045e-09
0.3	1.166e+13	5.110e-06	1.569e-03	9.693e-09	2.976e-06
0.4	1.430e+14	1.133e-03	2.204e-01	2.207e-06	4.295e-04
0.5	9.598e+11	6.524e-05	8.540e-03	1.281e-07	1.676e-05
0.6	1.681e+13	6.191e-03	5.774e-01	1.208e-05	1.127e-03
0.8	5.249e+12	2.491e-02	1.363e+00	4.738e-05	2.592e-03
1.0	2.195e+11	6.858e-03	2.505e-01	1.264e-05	4.618e-04
1.5	3.458e+11	2.564e-01	4.788e+00	4.314e-04	8.055e-03
2.0	2.926e+09	1.574e-02	1.971e-01	2.434e-05	3.048e-04
3.0	1.065e+10	6.264e-01	4.811e+00	8.499e-04	6.527e-03
TOTALS:	1.920e+14	9.378e-01	1.222e+01	1.380e-03	1.952e-02

For Information Only

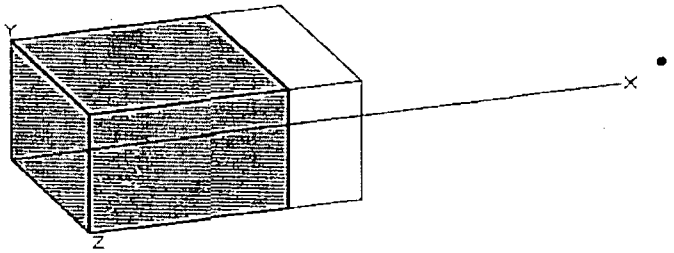
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
DOS File: SGTSGR.MS5
Date: August 29, 2005
Time: 2:17:01 PM
Duration: 00:00:34

EC-RADN-1129
Page 291

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

Case Title: SGTS Filter
Description: Time = 1 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	1.4245e-002	5.2705e+008	1.3570e-003	5.0209e+001
Am-242	6.1366e+000	2.2706e+011	5.8460e-001	2.1630e+004
Am-242m	9.3120e-004	3.4454e+007	8.8710e-005	3.2823e+000
Am-243	1.7551e-003	6.4940e+007	1.6720e-004	6.1864e+000
Am-244	7.2525e+000	2.6834e+011	6.9090e-001	2.5563e+004
Ba-135m	5.7398e+000	2.1237e+011	5.4680e-001	2.0232e+004
Ba-137m	2.3062e+003	8.5330e+013	2.1970e+002	8.1289e+006
Ba-139	1.8884e+004	6.9872e+014	1.7990e+003	6.6563e+007
Ba-140	2.7461e+004	1.0160e+015	2.6160e+003	9.6792e+007
Ba-141	2.5854e+003	9.5662e+013	2.4630e+002	9.1131e+006
Ba-142	4.6670e+002	1.7268e+013	4.4460e+001	1.6450e+006
Br-82	3.1607e+002	1.1695e+013	3.0110e+001	1.1141e+006
Br-83	8.7536e+003	3.2388e+014	8.3390e+002	3.0854e+007
Br-84	6.0632e+003	2.2434e+014	5.7760e+002	2.1371e+007
Ce-141	2.5214e+002	9.3292e+012	2.4020e+001	8.8874e+005
Ce-143	2.3062e+002	8.5330e+012	2.1970e+001	8.1289e+005
Ce-144	2.1246e+002	7.8611e+012	2.0240e+001	7.4888e+005
Cm-242	3.7464e+000	1.3862e+011	3.5690e-001	1.3205e+004
Cm-243	1.6134e-003	5.9696e+007	1.5370e-004	5.6869e+000
Cm-244	2.1887e-001	8.0980e+009	2.0850e-002	7.7145e+002
Co-58	4.1516e+000	1.5361e+011	3.9550e-001	1.4634e+004
Co-60	2.2369e+000	8.2767e+010	2.1310e-001	7.8847e+003
Co-60m	6.9733e-002	2.5801e+009	6.6430e-003	2.4579e+002
Co-61	3.2772e-002	1.2126e+009	3.1220e-003	1.1551e+002
Cs-132	3.0410e+000	1.1252e+011	2.8970e-001	1.0719e+004

DOS File: SGTSGR.MS5
Run Date: August 29, 2005
Run Time: 2:17:01 PM
Duration: 00:00:34

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Cs-134	1.6145e+004	5.9735e+014	1.5380e+003	5.6906e+007
Cs-134m	2.6610e+003	9.8458e+013	2.5350e+002	9.3795e+006
Cs-136	5.1436e+003	1.9031e+014	4.9000e+002	1.8130e+007
Cs-137	1.2177e+004	4.5054e+014	1.1600e+003	4.2920e+007
Cs-138	6.2762e+004	2.3222e+015	5.9790e+003	2.2122e+008
Cs-139	1.5882e+003	5.8764e+013	1.5130e+002	5.5981e+006
Eu-152m	1.2911e-002	4.7773e+008	1.2300e-003	4.5510e+001
Eu-154	5.9277e-001	2.1933e+010	5.6470e-002	2.0894e+003
Eu-155	2.4374e-001	9.0185e+009	2.3220e-002	8.5914e+002
Eu-156	1.5336e+001	5.6744e+011	1.4610e+000	5.4057e+004
I-128	1.8926e+002	7.0027e+012	1.8030e+001	6.6711e+005
I-130	2.1110e+003	7.8106e+013	2.0110e+002	7.4407e+006
I-131	9.0118e+004	3.3344e+015	8.5850e+003	3.1765e+008
I-132	1.3132e+005	4.8588e+015	1.2510e+004	4.6287e+008
I-133	1.8349e+005	6.7891e+015	1.7480e+004	6.4676e+008
I-134	1.4738e+005	5.4531e+015	1.4040e+004	5.1948e+008
I-135	1.6029e+005	5.9308e+015	1.5270e+004	5.6499e+008
La-140	1.1757e+002	4.3500e+012	1.1200e+001	4.1440e+005
La-141	9.0118e+001	3.3344e+012	8.5850e+000	3.1765e+005
La-142	6.9512e+001	2.5719e+012	6.6220e+000	2.4501e+005
Mo-99	1.4056e+003	5.2006e+013	1.3390e+002	4.9543e+006
Mo-101	7.5097e+001	2.7786e+012	7.1540e+000	2.6470e+005
Nb-95	1.0802e+002	3.9966e+012	1.0290e+001	3.8073e+005
Nb-95m	1.1977e+000	4.4316e+010	1.1410e-001	4.2217e+003
Nb-96	1.6984e-001	6.2842e+009	1.6180e-002	5.9866e+002
Nb-97	1.0560e+002	3.9072e+012	1.0060e+001	3.7222e+005
Nb-97m	9.7193e+001	3.5961e+012	9.2590e+000	3.4258e+005
Nd-147	4.0550e+001	1.5004e+012	3.8630e+000	1.4293e+005
Nd-149	1.5966e+001	5.9075e+011	1.5210e+000	5.6277e+004
Np-236m	6.5975e-004	2.4411e+007	6.2850e-005	2.3255e+000
Np-238	6.5114e+001	2.4092e+012	6.2030e+000	2.2951e+005
Np-239	2.9612e+003	1.0957e+014	2.8210e+002	1.0438e+007
Np-240	2.8216e+000	1.0440e+011	2.6880e-001	9.9456e+003
Pd-109	2.7681e+002	1.0242e+013	2.6370e+001	9.7569e+005
Pm-147	1.4077e+001	5.2084e+011	1.3410e+000	4.9617e+004
Pm-148	1.1284e+001	4.1752e+011	1.0750e+000	3.9775e+004
Pm-148m	2.1761e+000	8.0514e+010	2.0730e-001	7.6701e+003
Pm-149	3.6047e+001	1.3337e+012	3.4340e+000	1.2706e+005
Pm-151	1.1977e+001	4.4316e+011	1.1410e+000	4.2217e+004
Pr-142	3.9732e+000	1.4701e+011	3.7850e-001	1.4005e+004
Pr-143	9.0548e+001	3.3503e+012	8.6260e+000	3.1916e+005
Pr-144	8.4964e+001	3.1437e+012	8.0940e+000	2.9948e+005
Pr-144m	1.1883e+000	4.3966e+010	1.1320e-001	4.1884e+003
Pu-237	9.4086e-004	3.4812e+007	8.9630e-005	3.3163e+000
Pu-238	6.4043e-001	2.3696e+010	6.1010e-002	2.2574e+003
Pu-239	6.7801e-002	2.5086e+009	6.4590e-003	2.3898e+002
Pu-240	1.0938e-001	4.0471e+009	1.0420e-002	3.8554e+002
Pu-241	2.6925e+001	9.9623e+011	2.5650e+000	9.4905e+004
Pu-243	5.1069e+001	1.8895e+012	4.8650e+000	1.8001e+005
Rb-86	1.5179e+002	5.6162e+012	1.4460e+001	5.3502e+005
Rb-88	4.5327e+004	1.6771e+015	4.3180e+003	1.5977e+008
Rh-103m	1.2019e+003	4.4471e+013	1.1450e+002	4.2365e+006
Rh-105	7.8309e+002	2.8974e+013	7.4600e+001	2.7602e+006
Rh-105m	2.0973e+002	7.7601e+012	1.9980e+001	7.3926e+005

DOS File: SGTSGR.MS5
Run Date: August 29, 2005
Run Time: 2:17:01 PM
Duration: 00:00:34

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Rh-106	4.8056e+002	1.7781e+013	4.5780e+001	1.6939e+006
Ru-103	1.2019e+003	4.4471e+013	1.1450e+002	4.2365e+006
Ru-105	7.3491e+002	2.7191e+013	7.0010e+001	2.5904e+006
Ru-106	4.8056e+002	1.7781e+013	4.5780e+001	1.6939e+006
Sb-122	2.9717e+001	1.0995e+012	2.8310e+000	1.0475e+005
Sb-124	1.3646e+001	5.0491e+011	1.3000e+000	4.8100e+004
Sb-125	1.9252e+002	7.1232e+012	1.8340e+001	6.7858e+005
Sb-126	6.5093e+000	2.4084e+011	6.2010e-001	2.2944e+004
Sb-126m	8.6769e-001	3.2105e+010	8.2660e-002	3.0584e+003
Sb-127	1.3090e+003	4.8433e+013	1.2470e+002	4.6139e+006
Sb-129	4.2157e+003	1.5598e+014	4.0160e+002	1.4859e+007
Sm-151	3.8189e-002	1.4130e+009	3.6380e-003	1.3461e+002
Sm-153	2.9392e+001	1.0875e+012	2.8000e+000	1.0360e+005
Sr-89	1.4486e+004	5.3598e+014	1.3800e+003	5.1060e+007
Sr-90	1.8349e+003	6.7891e+013	1.7480e+002	6.4676e+006
Sr-91	1.7058e+004	6.3114e+014	1.6250e+003	6.0125e+007
Sr-92	1.5126e+004	5.5968e+014	1.4410e+003	5.3317e+007
Sr-93	8.1962e+001	3.0326e+012	7.8080e+000	2.8890e+005
Tc-99	1.5504e-002	5.7366e+008	1.4770e-003	5.4649e+001
Tc-99m	1.2555e+003	4.6452e+013	1.1960e+002	4.4252e+006
Tc-101	2.8059e+002	1.0382e+013	2.6730e+001	9.8901e+005
Te-123m	1.3625e-001	5.0414e+009	1.2980e-002	4.8026e+002
Te-125m	4.2492e+001	1.5722e+012	4.0480e+000	1.4978e+005
Te-127	1.3090e+003	4.8433e+013	1.2470e+002	4.6139e+006
Te-127m	2.2317e+002	8.2573e+012	2.1260e+001	7.8662e+005
Te-129	4.4844e+003	1.6592e+014	4.2720e+002	1.5806e+007
Te-129m	9.3551e+002	3.4614e+013	8.9120e+001	3.2974e+006
Te-131	6.2112e+003	2.2981e+014	5.9170e+002	2.1893e+007
Te-131m	2.9612e+003	1.0957e+014	2.8210e+002	1.0438e+007
Te-132	2.1456e+004	7.9388e+014	2.0440e+003	7.5628e+007
Te-133	2.0490e+003	7.5815e+013	1.9520e+002	7.2224e+006
Te-133m	6.5870e+003	2.4372e+014	6.2750e+002	2.3218e+007
Te-134	1.0128e+004	3.7472e+014	9.6480e+002	3.5698e+007
Y-90	7.6535e+000	2.8318e+011	7.2910e-001	2.6977e+004
Y-91	7.5537e+001	2.7949e+012	7.1960e+000	2.6625e+005
Y-91m	4.1579e+001	1.5384e+012	3.9610e+000	1.4656e+005
Y-92	7.6818e+001	2.8423e+012	7.3180e+000	2.7077e+005
Y-93	5.6643e+001	2.0958e+012	5.3960e+000	1.9965e+005
Zr-89	3.0767e-002	1.1384e+009	2.9310e-003	1.0845e+002
Zr-93	1.6690e-005	6.1755e+005	1.5900e-006	5.8830e-002
Zr-95	1.0760e+002	3.9810e+012	1.0250e+001	3.7925e+005
Zr-97	1.0235e+002	3.7868e+012	9.7500e+000	3.6075e+005

Buildup
The material reference is : Shield 1

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

DOS File: SGTSGR.MS5
Run Date: August 29, 2005
Run Time: 2:17:01 PM
Duration: 00:00:34

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.159e+11	0.000e+00	3.315e-24	0.000e+00	2.843e-25
0.02	1.264e+13	0.000e+00	5.692e-22	0.000e+00	1.972e-23
0.03	1.365e+15	1.165e-102	1.358e-19	1.154e-104	1.346e-21
0.04	3.349e+13	3.466e-50	8.842e-21	1.533e-52	3.910e-23
0.05	1.045e+14	2.101e-30	9.023e-20	5.598e-33	2.404e-22
0.06	2.682e+13	2.249e-22	1.673e-19	4.466e-25	3.323e-22
0.08	1.964e+14	2.565e-14	2.245e-12	4.059e-17	3.553e-15
0.1	1.483e+14	1.714e-11	3.358e-09	2.622e-14	5.137e-12
0.15	7.901e+14	1.168e-07	4.557e-05	1.923e-10	7.504e-08
0.2	1.394e+15	7.525e-06	3.296e-03	1.328e-08	5.818e-06
0.3	1.150e+15	5.039e-04	1.547e-01	9.559e-07	2.935e-04
0.4	4.225e+15	3.348e-02	6.514e+00	6.523e-05	1.269e-02
0.5	9.955e+15	6.766e-01	8.857e+01	1.328e-03	1.739e-01
0.6	9.698e+15	3.572e+00	3.332e+02	6.972e-03	6.503e-01
0.8	1.728e+16	8.197e+01	4.485e+03	1.559e-01	8.531e+00
1.0	7.878e+15	2.461e+02	8.991e+03	4.536e-01	1.657e+01
1.5	7.431e+15	5.510e+03	1.029e+05	9.271e+00	1.731e+02
2.0	2.083e+15	1.121e+04	1.403e+05	1.733e+01	2.170e+02
3.0	2.659e+14	1.565e+04	1.202e+05	2.123e+01	1.631e+02
4.0	1.620e+13	3.960e+03	2.252e+04	4.899e+00	2.786e+01
5.0	2.405e+12	1.525e+03	7.007e+03	1.748e+00	8.033e+00
TOTALS:	6.405e+16	3.818e+04	4.068e+05	5.510e+01	6.150e+02

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

Page : 1
DOS File: SGTSI38.MS5
Run Date: August 29, 2005
Run Time: 2:17:36 PM
Duration: 00:00:31

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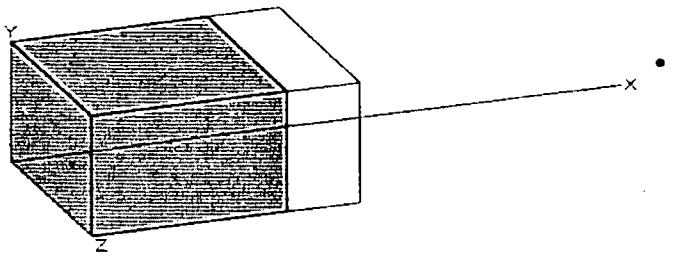
Page 295

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

Case Title: SGTS Filter
Description: Time = 1 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Cs-135m	1.4916e+003	5.5191e+013	1.4210e+002	5.2577e+006
Eu-157	1.4203e+000	5.2550e+010	1.3530e-001	5.0061e+003
Eu-158	2.4164e-001	8.9408e+009	2.3020e-002	8.5174e+002
La-143	4.9777e+000	1.8418e+011	4.7420e-001	1.7545e+004
Nd-151	4.3343e-001	1.6037e+010	4.1290e-002	1.5277e+003
Pm-150	2.3986e-001	8.8748e+009	2.2850e-002	8.4545e+002
Pr-145	5.7503e+001	2.1276e+012	5.4780e+000	2.0269e+005
Pr-147	2.0301e+000	7.5115e+010	1.9340e-001	7.1558e+003
Rh-106m	1.2229e+001	4.5248e+011	1.1650e+000	4.3105e+004
Rh-107	8.8501e+001	3.2746e+012	8.4310e+000	3.1195e+005
Sb-128a	2.1456e+002	7.9388e+012	2.0440e+001	7.5628e+005
Sb-128b	1.2765e+003	4.7229e+013	1.2160e+002	4.4992e+006
Sb-130	5.6538e+002	2.0919e+013	5.3860e+001	1.9928e+006
Sb-131	1.9630e+003	7.2630e+013	1.8700e+002	6.9190e+006
Se-81	1.1263e+002	4.1675e+012	1.0730e+001	3.9701e+005
Se-81m	2.6390e+001	9.7642e+011	2.5140e+000	9.3018e+004
Se-83	1.3300e+002	4.9210e+012	1.2670e+001	4.6879e+005
Sm-155	3.6950e-001	1.3671e+010	3.5200e-002	1.3024e+003
Sm-156	1.3384e+000	4.9520e+010	1.2750e-001	4.7175e+003
Y-94	1.0991e+001	4.0665e+011	1.0470e+000	3.8739e+004
Y-95				

Buildup
The material reference is : Shield 1

DOS File: SGTSI38.MS5
Run Date: August 29, 2005
Run Time: 2:17:36 PM
Duration: 00:00:31

Integration Parameters

X Direction	25
Y Direction	25
Z Direction	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.565e+08	0.000e+00	7.339e-27	0.000e+00	6.295e-28
0.02	5.818e+10	0.000e+00	2.619e-24	0.000e+00	9.073e-26
0.03	7.219e+12	6.161e-105	7.187e-22	6.106e-107	7.123e-24
0.04	1.806e+11	1.869e-52	4.768e-23	8.266e-55	2.109e-25
0.05	1.510e+10	3.036e-34	1.303e-23	8.087e-37	3.472e-26
0.06	1.363e+10	1.143e-25	8.503e-23	2.270e-28	1.689e-25
0.08	3.105e+10	4.054e-18	3.549e-16	6.415e-21	5.616e-19
0.1	6.335e+11	7.319e-14	1.434e-11	1.120e-16	2.194e-14
0.15	2.298e+12	3.397e-10	1.326e-07	5.594e-13	2.183e-10
0.2	1.792e+13	9.672e-08	4.237e-05	1.707e-10	7.477e-08
0.3	6.818e+13	2.987e-05	9.171e-03	5.667e-08	1.740e-05
0.4	9.286e+12	7.358e-05	1.432e-02	1.434e-07	2.790e-05
0.5	3.250e+13	2.209e-03	2.891e-01	4.335e-06	5.675e-04
0.6	7.558e+13	2.784e-02	2.596e+00	5.433e-05	5.068e-03
0.8	2.906e+14	1.379e+00	7.543e+01	2.622e-03	1.435e-01
1.0	8.101e+13	2.531e+00	9.245e+01	4.665e-03	1.704e-01
1.5	2.051e+13	1.521e+01	2.840e+02	2.559e-02	4.777e-01
2.0	1.587e+13	8.535e+01	1.069e+03	1.320e-01	1.653e+00
3.0	9.974e+11	5.869e+01	4.508e+02	7.963e-02	6.116e-01
TOTALS:	6.228e+14	1.632e+02	1.974e+03	2.445e-01	3.062e+00

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

Page : 1
DOS File: SGTSRAD.MS5
Date: August 29, 2005
Time: 2:18:07 PM
Duration: 00:00:32

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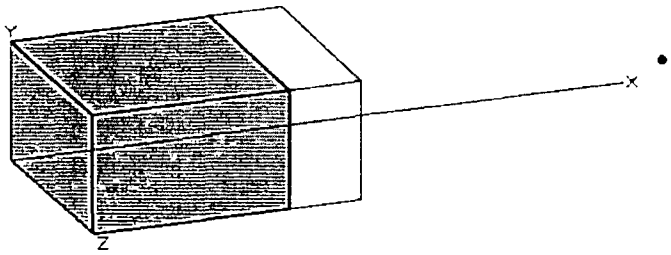
Page 297

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

Case Title: SGTS Filter
Description: Time = 1 hr
Geometry: 13 - Rectangular Volume



Source Dimensions

Length	247.65 cm	8 ft 1.5 in
Width	278.13 cm	9 ft 1.5 in
Height	152.4 cm	5 ft 0.0 in

Dose Points

	X	Y	Z
# 1	765.81 cm	76.2 cm	139.065 cm
	25 ft 1.5 in	2 ft 6.0 in	4 ft 6.7 in

Shields

Shield Name	Dimension	Material	Density
Source	1.05e+07 cm³	Water	0.43
Shield 1	91.44 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/cm³	Bq/cm³
Am-241	1.4245e-002	5.2705e+008	1.3570e-003	5.0209e+001
Ba-137m	2.3062e+003	8.5330e+013	2.1970e+002	8.1289e+006
Ba-139	1.8884e+004	6.9872e+014	1.7990e+003	6.6563e+007
Ba-140	2.7461e+004	1.0160e+015	2.6160e+003	9.6792e+007
Ce-141	2.5214e+002	9.3292e+012	2.4020e+001	8.8874e+005
Ce-143	2.3062e+002	8.5330e+012	2.1970e+001	8.1289e+005
Ce-144	2.1246e+002	7.8611e+012	2.0240e+001	7.4888e+005
Cm-242	3.7464e+000	1.3862e+011	3.5690e-001	1.3205e+004
Cm-244	2.1887e-001	8.0980e+009	2.0850e-002	7.7145e+002
Co-58	4.1516e+000	1.5361e+011	3.9550e-001	1.4634e+004
Co-60	2.2369e+000	8.2767e+010	2.1310e-001	7.8847e+003
Cs-134	1.6145e+004	5.9735e+014	1.5380e+003	5.6906e+007
Cs-136	5.1436e+003	1.9031e+014	4.9000e+002	1.8130e+007
Cs-137	1.2177e+004	4.5054e+014	1.1600e+003	4.2920e+007
I-131	9.0118e+004	3.3344e+015	8.5850e+003	3.1765e+008
I-132	1.3132e+005	4.8588e+015	1.2510e+004	4.6287e+008
I-133	1.8349e+005	6.7891e+015	1.7480e+004	6.4676e+008
I-134	1.4738e+005	5.4531e+015	1.4040e+004	5.1948e+008
I-135	1.6029e+005	5.9308e+015	1.5270e+004	5.6499e+008
La-140	1.1757e+002	4.3500e+012	1.1200e+001	4.1440e+005
La-141	9.0118e+001	3.3344e+012	8.5850e+000	3.1765e+005
La-142	6.9512e+001	2.5719e+012	6.6220e+000	2.4501e+005
Mo-99	1.4056e+003	5.2006e+013	1.3390e+002	4.9543e+006
Nb-95	1.0802e+002	3.9966e+012	1.0290e+001	3.8073e+005
Nd-147	4.0550e+001	1.5004e+012	3.8630e+000	1.4293e+005

DOS File: SGTSRAD.MS5
Run Date: August 29, 2005
Run Time: 2:18:07 PM
Duration: 00:00:32

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Np-239	2.9612e+003	1.0957e+014	2.8210e+002	1.0438e+007
Pr-143	9.0548e+001	3.3503e+012	8.6260e+000	3.1916e+005
Pr-144	8.4964e+001	3.1437e+012	8.0940e+000	2.9948e+005
Pu-238	6.4043e-001	2.3696e+010	6.1010e-002	2.2574e+003
Pu-239	6.7801e-002	2.5086e+009	6.4590e-003	2.3898e+002
Pu-240	1.0938e-001	4.0471e+009	1.0420e-002	3.8554e+002
Pu-241	2.6925e+001	9.9623e+011	2.5650e+000	9.4905e+004
Rb-86	1.5179e+002	5.6162e+012	1.4460e+001	5.3502e+005
Rh-103m	1.2019e+003	4.4471e+013	1.1450e+002	4.2365e+006
Rh-105	7.8309e+002	2.8974e+013	7.4600e+001	2.7602e+006
Rh-106	4.8056e+002	1.7781e+013	4.5780e+001	1.6939e+006
Ru-103	1.2019e+003	4.4471e+013	1.1450e+002	4.2365e+006
Ru-105	7.3491e+002	2.7191e+013	7.0010e+001	2.5904e+006
Ru-106	4.8056e+002	1.7781e+013	4.5780e+001	1.6939e+006
Sb-127	1.3090e+003	4.8433e+013	1.2470e+002	4.6139e+006
Sb-129	4.2157e+003	1.5598e+014	4.0160e+002	1.4859e+007
Sr-89	1.4486e+004	5.3598e+014	1.3800e+003	5.1060e+007
Sr-90	1.8349e+003	6.7891e+013	1.7480e+002	6.4676e+006
Sr-91	1.7058e+004	6.3114e+014	1.6250e+003	6.0125e+007
Sr-92	1.5126e+004	5.5968e+014	1.4410e+003	5.3317e+007
Tc-99m	1.2555e+003	4.6452e+013	1.1960e+002	4.4252e+006
Te-127	1.3090e+003	4.8433e+013	1.2470e+002	4.6139e+006
Te-127m	2.2317e+002	8.2573e+012	2.1260e+001	7.8662e+005
Te-129	4.4844e+003	1.6592e+014	4.2720e+002	1.5806e+007
Te-129m	9.3551e+002	3.4614e+013	8.9120e+001	3.2974e+006
Te-131m	2.9612e+003	1.0957e+014	2.8210e+002	1.0438e+007
Te-132	2.1456e+004	7.9388e+014	2.0440e+003	7.5628e+007
Y-90	7.6535e+000	2.8318e+011	7.2910e-001	2.6977e+004
Y-91	7.5537e+001	2.7949e+012	7.1960e+000	2.6625e+005
Y-92	7.6818e+001	2.8423e+012	7.3180e+000	2.7077e+005
Y-93	5.6643e+001	2.0958e+012	5.3960e+000	1.9965e+005
Zr-95	1.0760e+002	3.9810e+012	1.0250e+001	3.7925e+005
Zr-97	1.0235e+003	3.7868e+013	9.7500e+001	3.6075e+006

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 MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	5.215e+09	0.000e+00	1.492e-25	0.000e+00	1.280e-26
0.02	9.109e+12	0.000e+00	4.101e-22	0.000e+00	1.420e-23
0.03	1.110e+15	9.472e-103	1.105e-19	9.387e-105	1.095e-21
0.04	2.524e+13	2.612e-50	6.664e-21	1.155e-52	2.947e-23
0.05	1.044e+14	2.098e-30	9.007e-20	5.589e-33	2.400e-22
0.06	2.667e+13	2.236e-22	1.664e-19	4.441e-25	3.304e-22

DOS File: SGTSRAD.MS5
Run Date: August 29, 2005
Run Time: 2:18:07 PM
Duration: 00:00:32

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.08	1.042e+14	1.361e-14	1.191e-12	2.154e-17	1.885e-15
0.1	1.206e+14	1.393e-11	2.730e-09	2.131e-14	4.177e-12
0.15	5.465e+14	8.077e-08	3.152e-05	1.330e-10	5.190e-08
0.2	1.080e+15	5.828e-06	2.553e-03	1.029e-08	4.506e-06
0.3	8.642e+14	3.786e-04	1.162e-01	7.182e-07	2.205e-04
0.4	3.944e+15	3.125e-02	6.081e+00	6.089e-05	1.185e-02
0.5	8.746e+15	5.945e-01	7.782e+01	1.167e-03	1.527e-01
0.6	9.387e+15	3.457e+00	3.225e+02	6.748e-03	6.294e-01
0.8	1.639e+16	7.778e+01	4.255e+03	1.479e-01	8.094e+00
1.0	6.734e+15	2.104e+02	7.685e+03	3.877e-01	1.417e+01
1.5	5.434e+15	4.029e+03	7.522e+04	6.779e+00	1.266e+02
2.0	1.258e+15	6.767e+03	8.475e+04	1.046e+01	1.311e+02
3.0	8.597e+11	5.059e+01	3.886e+02	6.864e-02	5.272e-01
4.0	6.751e+10	1.650e+01	9.385e+01	2.041e-02	1.161e-01
TOTALS:	5.589e+16	1.116e+04	1.728e+05	1.788e+01	2.813e+02

For Information Only

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.	PROJECT	Calc. No. EC-RADN-1129
Date 08/31/2005	DBA-LOCA Total Control Room Dose	
Designed By T.F. Mackay		Sh. No. 300
Checked By M.M. Waselus		

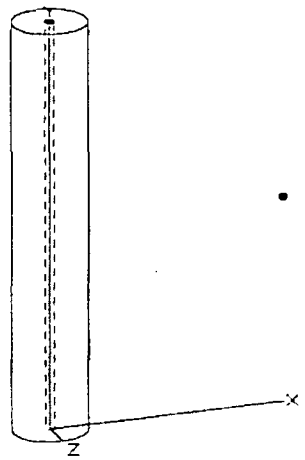
ATTACHMENT 7
MICROSHIELD COMPUTER CODE OUTPUT
10"GBB-103 SHINE TO COMPUTER ROOM ELEVATION 683'-0"

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

Page : 1
DOS File: 10CS166.MS5
Date: August 10, 2005
Time: 6:13:42 PM
Duration: 00:00:26

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = .1667 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241				
Ba-137m	4.8699e+001	1.8019e+012	7.2974e+001	2.7001e+006
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	6.8402e+001	2.5309e+012	1.0250e+002	3.7925e+006
Cs-136	2.1829e+001	8.0766e+011	3.2710e+001	1.2103e+006
Cs-137	5.1479e+001	1.9047e+012	7.7140e+001	2.8542e+006
I-131	3.1779e+002	1.1758e+013	4.7620e+002	1.7619e+007
I-132	4.4939e+002	1.6627e+013	6.7340e+002	2.4916e+007
I-133	6.5746e+002	2.4326e+013	9.8520e+002	3.6452e+007
I-134	6.3944e+002	2.3659e+013	9.5820e+002	3.5453e+007
I-135	6.1669e+002	2.2817e+013	9.2410e+002	3.4192e+007
La-140				
La-141				
La-142				
Mo-99				
Nb-95				

DOS File: 10CS166.MS5
Run Date: August 10, 2005
Run Time: 6:13:42 PM
Duration: 00:00:26

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	6.4538e-001	2.3879e+010	9.6710e-001	3.5783e+004
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.436e+12	4.638e-143	8.816e-23	4.597e-145	8.737e-25
0.04	5.551e+10	1.974e-70	9.037e-24	8.732e-73	3.997e-26
0.06	1.007e+11	1.033e-31	3.845e-22	2.051e-34	7.638e-25
0.08	3.586e+11	2.833e-21	2.908e-19	4.483e-24	4.602e-22
0.1	3.301e+09	2.437e-19	6.357e-17	3.728e-22	9.725e-20

DOS File: 10CS166.MS5
Run Date: August 10, 2005
Run Time: 6:13:42 PM
Duration: 00:00:26

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.15	1.280e+12	9.261e-13	5.003e-10	1.525e-15	8.239e-13
0.2	1.313e+12	7.285e-11	4.492e-08	1.286e-13	7.927e-11
0.3	2.790e+12	2.587e-08	1.096e-05	4.907e-11	2.079e-08
0.4	1.423e+13	3.626e-06	9.472e-04	7.066e-09	1.845e-06
0.5	3.045e+13	8.960e-05	1.537e-02	1.759e-07	3.018e-05
0.6	3.528e+13	7.065e-04	8.470e-02	1.379e-06	1.653e-04
0.8	6.444e+13	2.328e-02	1.589e+00	4.428e-05	3.023e-03
1.0	2.490e+13	7.550e-02	3.364e+00	1.392e-04	6.202e-03
1.5	1.878e+13	1.998e+00	4.394e+01	3.361e-03	7.393e-02
2.0	4.953e+12	4.791e+00	6.932e+01	7.408e-03	1.072e-01
TOTALS:	2.004e+14	6.888e+00	1.183e+02	1.095e-02	1.905e-01

For Information Only

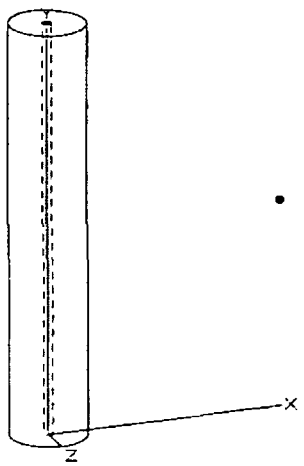
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
DOS File: 10CS05.MS5
Date: August 10, 2005
Time: 6:12:06 PM
Duration: 00:00:26

EC-RADN-1129
Page 304

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 0.5hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241				
Ba-137m	1.4602e+002	5.4027e+012	2.1881e+002	8.0960e+006
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	2.0507e+002	7.5877e+012	3.0730e+002	1.1370e+007
Cs-136	6.5413e+001	2.4203e+012	9.8020e+001	3.6267e+006
Cs-137	1.5436e+002	5.7112e+012	2.3130e+002	8.5581e+006
I-131	9.5163e+002	3.5210e+013	1.4260e+003	5.2762e+007
I-132	1.2813e+003	4.7408e+013	1.9200e+003	7.1040e+007
I-133	1.9500e+003	7.2149e+013	2.9220e+003	1.0811e+008
I-134	1.4735e+003	5.4519e+013	2.2080e+003	8.1696e+007
I-135	1.7858e+003	6.6075e+013	2.6760e+003	9.9012e+007
La-140				
La-141				
La-142				
Mo-99				
Nb-95				

DOS File: 10CS05.MS5
Run Date: August 10, 2005
Run Time: 6:12:06 PM
Duration: 00:00:26

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	1.9339e+000	7.1556e+010	2.8980e+000	1.0723e+005
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	4.029e+12	1.301e-142	2.474e-22	1.290e-144	2.452e-24
0.04	1.664e+11	5.918e-70	2.709e-23	2.617e-72	1.198e-25
0.06	3.016e+11	3.095e-31	1.152e-21	6.147e-34	2.289e-24
0.08	1.074e+12	8.484e-21	8.709e-19	1.343e-23	1.378e-21
0.1	9.893e+09	7.302e-19	1.905e-16	1.117e-21	2.914e-19

DOS File: 10CS05.MS5
Run Date: August 10, 2005
Run Time: 6:12:06 PM
Duration: 00:00:26

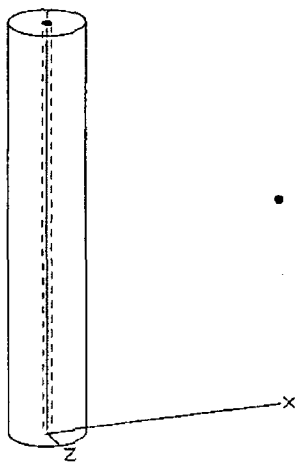
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.15	3.042e+12	2.201e-12	1.189e-09	3.624e-15	1.958e-12
0.2	3.405e+12	1.890e-10	1.165e-07	3.335e-13	2.056e-10
0.3	8.108e+12	7.516e-08	3.184e-05	1.426e-10	6.039e-08
0.4	4.036e+13	1.029e-05	2.687e-03	2.005e-08	5.236e-06
0.5	8.767e+13	2.580e-04	4.426e-02	5.064e-07	8.688e-05
0.6	9.708e+13	1.944e-03	2.330e-01	3.794e-06	4.549e-04
0.8	1.618e+14	5.844e-02	3.989e+00	1.112e-04	7.588e-03
1.0	6.663e+13	2.020e-01	9.001e+00	3.723e-04	1.659e-02
1.5	5.243e+13	5.578e+00	1.227e+02	9.385e-03	2.064e-01
2.0	1.320e+13	1.276e+01	1.847e+02	1.974e-02	2.856e-01
TOTALS:	5.393e+14	1.861e+01	3.207e+02	2.961e-02	5.168e-01

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

Page : 1
DOS File: 10CS1.MS5
Date: August 30, 2005
Time: 1:27:15 PM
Duration: 00:00:33

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 1 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241	3.0230e-004	1.1185e+007	4.5300e-004	1.6761e+001
Ba-137m	3.4065e+002	1.2604e+013	5.1046e+002	1.8887e+007
Ba-139	1.4041e+002	5.1951e+012	2.1040e+002	7.7848e+006
Ba-140	2.3263e+002	8.6075e+012	3.4860e+002	1.2898e+007
Ce-141	5.3481e+000	1.9788e+011	8.0140e+000	2.9652e+005
Ce-143	4.8622e+000	1.7990e+011	7.2860e+000	2.6958e+005
Ce-144	4.4972e+000	1.6640e+011	6.7390e+000	2.4934e+005
Cm-242	7.9146e-002	2.9284e+009	1.1860e-001	4.3882e+003
Cm-244	4.6393e-003	1.7166e+008	6.9520e-003	2.5722e+002
Co-58	8.8089e-002	3.2593e+009	1.3200e-001	4.8840e+003
Co-60	4.7434e-002	1.7551e+009	7.1080e-002	2.6300e+003
Cs-134	4.7842e+002	1.7701e+013	7.1690e+002	2.6525e+007
Cs-136	1.5242e+002	5.6395e+012	2.2840e+002	8.4508e+006
Cs-137	3.6010e+002	1.3324e+013	5.3960e+002	1.9965e+007
I-131	2.5339e+003	9.3754e+013	3.7970e+003	1.4049e+008
I-132	3.2713e+003	1.2104e+014	4.9020e+003	1.8137e+008
I-133	5.1125e+003	1.8916e+014	7.6610e+003	2.8346e+008
I-134	2.6453e+003	9.7877e+013	3.9640e+003	1.4667e+008
I-135	4.5179e+003	1.6716e+014	6.7700e+003	2.5049e+008
La-140	3.6697e+000	1.3578e+011	5.4990e+000	2.0346e+005
La-141	1.7738e+000	6.5630e+010	2.6580e+000	9.8346e+004
La-142	1.3213e+000	4.8889e+010	1.9800e+000	7.3260e+004
Mo-99	2.9730e+001	1.1000e+012	4.4550e+001	1.6483e+006
Nb-95	2.2836e+000	8.4494e+010	3.4220e+000	1.2661e+005

DOS File: 10CS1.MS5
Run Date: August 30, 2005
Run Time: 1:27:15 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	8.6153e-001	3.1877e+010	1.2910e+000	4.7767e+004
Np-239	6.2323e+001	2.3059e+012	9.3390e+001	3.4554e+006
Pr-143	1.9159e+000	7.0889e+010	2.8710e+000	1.0623e+005
Pr-144	4.4329e+000	1.6402e+011	6.6426e+000	2.4578e+005
Pu-238	1.3554e-002	5.0149e+008	2.0310e-002	7.5147e+002
Pu-239	1.4394e-003	5.3260e+007	2.1570e-003	7.9809e+001
Pu-240	2.3150e-003	8.5655e+007	3.4690e-003	1.2835e+002
Pu-241	5.7091e-001	2.1124e+010	8.5550e-001	3.1654e+004
Rb-86	4.5085e+000	1.6682e+011	6.7560e+000	2.4997e+005
Rh-103m	2.5518e+001	9.4418e+011	3.8239e+001	1.4148e+006
Rh-105	1.6490e+001	6.1013e+011	2.4710e+001	9.1427e+005
Rh-106	1.0197e+001	3.7729e+011	1.5280e+001	5.6536e+005
Ru-103	2.5586e+001	9.4667e+011	3.8340e+001	1.4186e+006
Ru-105	1.5135e+001	5.6000e+011	2.2680e+001	8.3916e+005
Ru-106	1.0197e+001	3.7729e+011	1.5280e+001	5.6536e+005
Sb-127	2.7735e+001	1.0262e+012	4.1560e+001	1.5377e+006
Sb-129	8.7955e+001	3.2543e+012	1.3180e+002	4.8766e+006
Sr-89	1.2226e+002	4.5235e+012	1.8320e+002	6.7784e+006
Sr-90	1.5589e+001	5.7679e+011	2.3360e+001	8.6432e+005
Sr-91	1.4495e+002	5.3630e+012	2.1720e+002	8.0364e+006
Sr-92	1.2820e+002	4.7432e+012	1.9210e+002	7.1077e+006
Tc-99m	2.6607e+001	9.8445e+011	3.9870e+001	1.4752e+006
Te-127	2.7695e+001	1.0247e+012	4.1500e+001	1.5355e+006
Te-127m	4.7254e+000	1.7484e+011	7.0810e+000	2.6200e+005
Te-129	9.3561e+001	3.4618e+012	1.4020e+002	5.1874e+006
Te-129m	1.9793e+001	7.3235e+011	2.9660e+001	1.0974e+006
Te-131m	6.2470e+001	2.3114e+012	9.3610e+001	3.4636e+006
Te-132	4.5412e+002	1.6803e+013	6.8050e+002	2.5179e+007
Y-90	2.1168e-001	7.8322e+009	3.1720e-001	1.1736e+004
Y-91	1.6016e+000	5.9260e+010	2.4000e+000	8.8800e+004
Y-92	9.2360e+000	3.4173e+011	1.3840e+001	5.1208e+005
Y-93	1.1872e+000	4.3926e+010	1.7790e+000	6.5823e+004
Zr-95	2.2823e+000	8.4445e+010	3.4200e+000	1.2654e+005
Zr-97	2.1689e+000	8.0247e+010	3.2500e+000	1.2025e+005

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.099e+08	0.000e+00	1.939e-27	0.000e+00	1.663e-28
0.02	1.930e+11	0.000e+00	5.359e-24	0.000e+00	1.856e-25
0.03	2.340e+13	7.558e-142	1.437e-21	7.490e-144	1.424e-23
0.04	6.380e+11	2.269e-69	1.039e-22	1.004e-71	4.593e-25
0.05	2.209e+12	2.888e-42	1.176e-21	7.692e-45	3.132e-24

DOS File: 10CS1.MS5
Run Date: August 30, 2005
Run Time: 1:27:15 PM
Duration: 00:00:33

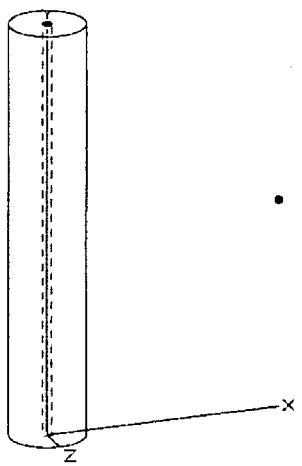
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	7.651e+11	7.850e-31	2.923e-21	1.559e-33	5.805e-24
0.08	2.914e+12	2.302e-20	2.363e-18	3.643e-23	3.739e-21
0.1	2.540e+12	1.875e-16	4.890e-14	2.868e-19	7.481e-17
0.15	8.410e+12	6.085e-12	3.287e-09	1.002e-14	5.414e-12
0.2	2.326e+13	1.291e-09	7.958e-07	2.278e-12	1.405e-09
0.3	2.216e+13	2.054e-07	8.703e-05	3.897e-10	1.651e-07
0.4	1.019e+14	2.598e-05	6.787e-03	5.063e-08	1.322e-05
0.5	2.274e+14	6.690e-04	1.148e-01	1.313e-06	2.253e-04
0.6	2.333e+14	4.671e-03	5.600e-01	9.117e-06	1.093e-03
0.8	3.448e+14	1.246e-01	8.504e+00	2.370e-04	1.617e-02
1.0	1.578e+14	4.783e-01	2.131e+01	8.816e-04	3.929e-02
1.5	1.327e+14	1.412e+01	3.105e+02	2.375e-02	5.225e-01
2.0	3.039e+13	2.939e+01	4.253e+02	4.545e-02	6.577e-01
3.0	1.823e+10	2.461e-01	2.128e+00	3.339e-04	2.887e-03
4.0	1.283e+09	8.135e-02	5.139e-01	1.006e-04	6.357e-04
TOTALS:	1.315e+15	4.445e+01	7.690e+02	7.077e-02	1.240e+00

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

Page : 1
DOS File: 10CS2.MS5
Date: August 10, 2005
Time: 6:14:08 PM
Duration: 00:00:34

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 2 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241	9.0691e-004	3.3556e+007	1.3590e-003	5.0283e+001
Ba-137m	7.2979e+002	2.7002e+013	1.0936e+003	4.0462e+007
Ba-139	2.5466e+002	9.4223e+012	3.8160e+002	1.4119e+007
Ba-140	6.9603e+002	2.5753e+013	1.0430e+003	3.8591e+007
Ce-141	1.6029e+001	5.9309e+011	2.4020e+001	8.8874e+005
Ce-143	1.4274e+001	5.2815e+011	2.1390e+001	7.9143e+005
Ce-144	1.3480e+001	4.9877e+011	2.0200e+001	7.4740e+005
Cm-242	2.3724e-001	8.7778e+009	3.5550e-001	1.3153e+004
Cm-244	1.3907e-002	5.1457e+008	2.0840e-002	7.7108e+002
Co-58	2.6407e-001	9.7704e+009	3.9570e-001	1.4641e+004
Co-60	1.4221e-001	5.2618e+009	2.1310e-001	7.8847e+003
Cs-134	1.0244e+003	3.7902e+013	1.5350e+003	5.6795e+007
Cs-136	3.2573e+002	1.2052e+013	4.8810e+002	1.8060e+007
Cs-137	7.7144e+002	2.8543e+013	1.1560e+003	4.2772e+007
I-131	5.6791e+003	2.1012e+014	8.5100e+003	3.1487e+008
I-132	6.6247e+003	2.4511e+014	9.9270e+003	3.6730e+008
I-133	1.1118e+004	4.1136e+014	1.6660e+004	6.1642e+008
I-134	2.6981e+003	9.9828e+013	4.0430e+003	1.4959e+008
I-135	9.1492e+003	3.3852e+014	1.3710e+004	5.0727e+008
La-140	1.6857e+001	6.2371e+011	2.5260e+001	9.3462e+005
La-141	4.4578e+000	1.6494e+011	6.6800e+000	2.4716e+005
La-142	2.5285e+000	9.3556e+010	3.7890e+000	1.4019e+005
Mo-99	8.8222e+001	3.2642e+012	1.3220e+002	4.8914e+006
Nb-95	6.8469e+000	2.5334e+011	1.0260e+001	3.7962e+005

DOS File: 10CS2.MS5
Run Date: August 10, 2005
Run Time: 6:14:08 PM
Duration: 00:00:34

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.5753e+000	9.5285e+010	3.8590e+000	1.4278e+005
Np-239	1.8459e+002	6.8297e+012	2.7660e+002	1.0234e+007
Pr-143	5.7545e+000	2.1292e+011	8.6230e+000	3.1905e+005
Pr-144	1.3287e+001	4.9164e+011	1.9911e+001	7.3671e+005
Pu-238	4.0634e-002	1.5035e+009	6.0890e-002	2.2529e+003
Pu-239	4.3163e-002	1.5970e+009	6.4680e-002	2.3932e+003
Pu-240	6.9403e-003	2.5679e+008	1.0400e-002	3.8480e+002
Pu-241	1.7117e+000	6.3334e+010	2.5650e+000	9.4905e+004
Rb-86	9.6430e+000	3.5679e+011	1.4450e+001	5.3465e+005
Rh-103m	7.6476e+001	2.8296e+012	1.1460e+002	4.2401e+006
Rh-105	4.9296e+001	1.8240e+012	7.3870e+001	2.7332e+006
Rh-106	3.0564e+001	1.1309e+012	4.5800e+001	1.6946e+006
Ru-103	7.6677e+001	2.8371e+012	1.1490e+002	4.2513e+006
Ru-105	3.8812e+001	1.4361e+012	5.8160e+001	2.1519e+006
Ru-106	3.0564e+001	1.1309e+012	4.5800e+001	1.6946e+006
Sb-127	8.2550e+001	3.0543e+012	1.2370e+002	4.5769e+006
Sb-129	2.2463e+002	8.3112e+012	3.3660e+002	1.2454e+007
Sr-89	3.6637e+002	1.3556e+013	5.4900e+002	2.0313e+007
Sr-90	4.6747e+001	1.7296e+012	7.0050e+001	2.5919e+006
Sr-91	4.0401e+002	1.4948e+013	6.0540e+002	2.2400e+007
Sr-92	2.9750e+002	1.1007e+013	4.4580e+002	1.6495e+007
Tc-99m	7.9614e+001	2.9457e+012	1.1930e+002	4.4141e+006
Te-127	8.2950e+001	3.0692e+012	1.2430e+002	4.5991e+006
Te-127m	1.4168e+001	5.2420e+011	2.1230e+001	7.8551e+005
Te-129	2.5839e+002	9.5606e+012	3.8720e+002	1.4326e+007
Te-129m	5.9333e+001	2.1953e+012	8.8910e+001	3.2897e+006
Te-131m	1.8305e+002	6.7729e+012	2.7430e+002	1.0149e+007
Te-132	1.3494e+003	4.9926e+013	2.0220e+003	7.4814e+007
Y-90	8.8356e-001	3.2692e+010	1.3240e+000	4.8988e+004
Y-91	4.8415e+000	1.7914e+011	7.2550e+000	2.6843e+005
Y-92	5.2686e+001	1.9494e+012	7.8950e+001	2.9212e+006
Y-93	3.3227e+000	1.2294e+011	4.9790e+000	1.8422e+005
Zr-95	6.8402e+000	2.5309e+011	1.0250e+001	3.7925e+005
Zr-97	6.2410e+000	2.3092e+011	9.3520e+000	3.4602e+005

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.214e+08	0.000e+00	5.671e-27	0.000e+00	4.864e-28
0.02	5.757e+11	0.000e+00	1.598e-23	0.000e+00	5.537e-25
0.03	5.988e+13	1.934e-141	3.676e-21	1.917e-143	3.643e-23
0.04	1.534e+12	5.456e-69	2.497e-22	2.413e-71	1.104e-24
0.05	6.564e+12	8.580e-42	3.493e-21	2.286e-44	9.306e-24

DOS File: 10CS2.MS5
Run Date: August 10, 2005
Run Time: 6:14:08 PM
Duration: 00:00:34

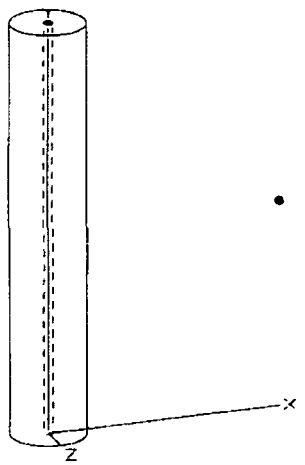
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.686e+12	1.730e-30	6.441e-21	3.436e-33	1.279e-23
0.08	6.566e+12	5.187e-20	5.324e-18	8.208e-23	8.426e-21
0.1	7.499e+12	5.535e-16	1.444e-13	8.468e-19	2.209e-16
0.15	1.391e+13	1.007e-11	5.438e-09	1.658e-14	8.955e-12
0.2	5.921e+13	3.286e-09	2.026e-06	5.800e-12	3.576e-09
0.3	4.779e+13	4.430e-07	1.877e-04	8.404e-10	3.560e-07
0.4	2.114e+14	5.389e-05	1.408e-02	1.050e-07	2.743e-05
0.5	4.769e+14	1.403e-03	2.408e-01	2.754e-06	4.726e-04
0.6	4.464e+14	8.939e-03	1.072e+00	1.745e-05	2.092e-03
0.8	5.351e+14	1.933e-01	1.320e+01	3.677e-04	2.510e-02
1.0	2.863e+14	8.678e-01	3.867e+01	1.600e-03	7.128e-02
1.5	2.583e+14	2.748e+01	6.046e+02	4.624e-02	1.017e+00
2.0	5.378e+13	5.201e+01	7.526e+02	8.043e-02	1.164e+00
3.0	4.785e+10	6.458e-01	5.585e+00	8.761e-04	7.577e-03
4.0	2.456e+09	1.557e-01	9.833e-01	1.926e-04	1.217e-03
TOTALS:	2.474e+15	8.137e+01	1.417e+03	1.297e-01	2.289e+00

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

Page : 1
DOS File: 10CS4.MS5
[redacted]ate: August 10, 2005
[redacted]ime: 6:15:50 PM
Duration: 00:00:34

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 4 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241	9.0491e-004	3.3482e+007	1.3560e-003	5.0172e+001
Ba-137m	7.2789e+002	2.6932e+013	1.0907e+003	4.0357e+007
Ba-139	9.2894e+001	3.4371e+012	1.3920e+002	5.1504e+006
Ba-140	6.9136e+002	2.5580e+013	1.0360e+003	3.8332e+007
Ce-141	1.5969e+001	5.9087e+011	2.3930e+001	8.8541e+005
Ce-143	1.3654e+001	5.0519e+011	2.0460e+001	7.5702e+005
Ce-144	1.3447e+001	4.9753e+011	2.0150e+001	7.4555e+005
Cm-242	2.3657e-001	8.7531e+009	3.5450e-001	1.3117e+004
Cm-244	1.3874e-002	5.1334e+008	2.0790e-002	7.6923e+002
Co-58	2.6327e-001	9.7408e+009	3.9450e-001	1.4596e+004
Co-60	1.4188e-001	5.2494e+009	2.1260e-001	7.8662e+003
Cs-134	1.0217e+003	3.7803e+013	1.5310e+003	5.6647e+007
Cs-136	3.2346e+002	1.1968e+013	4.8470e+002	1.7934e+007
Cs-137	7.6944e+002	2.8469e+013	1.1530e+003	4.2661e+007
I-131	5.6257e+003	2.0815e+014	8.4300e+003	3.1191e+008
I-132	4.2296e+003	1.5649e+014	6.3380e+003	2.3451e+008
I-133	1.0377e+004	3.8395e+014	1.5550e+004	5.7535e+008
I-134	5.5362e+002	2.0484e+013	8.2960e+002	3.0695e+007
I-135	7.4008e+003	2.7383e+014	1.1090e+004	4.1033e+008
La-140	3.9700e+001	1.4689e+012	5.9490e+001	2.2011e+006
La-141	3.1251e+000	1.1563e+011	4.6830e+000	1.7327e+005
La-142	1.0264e+000	3.7976e+010	1.5380e+000	5.6906e+004
Mo-99	8.6153e+001	3.1877e+012	1.2910e+002	4.7767e+006
Nb-95	6.8269e+000	2.5259e+011	1.0230e+001	3.7851e+005

DOS File: 10CS4.MS5
Run Date: August 10, 2005
Run Time: 6:15:50 PM
Duration: 00:00:34

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.5559e+000	9.4569e+010	3.8300e+000	1.4171e+005
Np-239	1.7965e+002	6.6470e+012	2.6920e+002	9.9604e+006
Pr-143	5.7751e+000	2.1368e+011	8.6540e+000	3.2020e+005
Pr-144	1.3255e+001	4.9042e+011	1.9862e+001	7.3489e+005
Pu-238	4.0534e-002	1.4998e+009	6.0740e-002	2.2474e+003
Pu-239	4.3070e-003	1.5936e+008	6.4540e-003	2.3880e+002
Pu-240	6.9203e-003	2.5605e+008	1.0370e-002	3.8369e+002
Pu-241	1.7077e+000	6.3186e+010	2.5590e+000	9.4683e+004
Rb-86	9.5897e+000	3.5482e+011	1.4370e+001	5.3169e+005
Rh-103m	7.6143e+001	2.8173e+012	1.1410e+002	4.2217e+006
Rh-105	4.8562e+001	1.7968e+012	7.2770e+001	2.6925e+006
Rh-106	3.0484e+001	1.1279e+012	4.5680e+001	1.6902e+006
Ru-103	7.6344e+001	2.8247e+012	1.1440e+002	4.2328e+006
Ru-105	2.8335e+001	1.0484e+012	4.2460e+001	1.5710e+006
Ru-106	3.0484e+001	1.1279e+012	4.5680e+001	1.6902e+006
Sb-127	8.1082e+001	3.0000e+012	1.2150e+002	4.4955e+006
Sb-129	1.6256e+002	6.0149e+012	2.4360e+002	9.0132e+006
Sr-89	3.6510e+002	1.3509e+013	5.4710e+002	2.0243e+007
Sr-90	4.6634e+001	1.7254e+012	6.9880e+001	2.5856e+006
Sr-91	3.4828e+002	1.2887e+013	5.2190e+002	1.9310e+007
Sr-92	1.7798e+002	6.5852e+012	2.6670e+002	9.8679e+006
Tc-99m	7.8946e+001	2.9210e+012	1.1830e+002	4.3771e+006
Te-127	8.2550e+001	3.0543e+012	1.2370e+002	4.5769e+006
Te-127m	1.4134e+001	5.2297e+011	2.1180e+001	7.8366e+005
Te-129	2.0841e+002	7.7112e+012	3.1230e+002	1.1555e+007
Te-129m	5.9160e+001	2.1889e+012	8.8650e+001	3.2801e+006
Te-131m	1.7431e+002	6.4494e+012	2.6120e+002	9.6644e+006
Te-132	1.3227e+003	4.8939e+013	1.9820e+003	7.3334e+007
Y-90	1.8619e+000	6.8889e+010	2.7900e+000	1.0323e+005
Y-91	4.9803e+000	1.8427e+011	7.4630e+000	2.7613e+005
Y-92	1.1031e+002	4.0815e+012	1.6530e+002	6.1161e+006
Y-93	2.8896e+000	1.0691e+011	4.3300e+000	1.6021e+005
Zr-95	6.8202e+000	2.5235e+011	1.0220e+001	3.7814e+005
Zr-97	5.7358e+000	2.1222e+011	8.5950e+000	3.1802e+005

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.059e+08	0.000e+00	5.398e-27	0.000e+00	4.630e-28
0.02	5.681e+11	0.000e+00	1.577e-23	0.000e+00	5.464e-25
0.03	5.653e+13	1.826e-141	3.471e-21	1.810e-143	3.440e-23
0.04	1.478e+12	5.258e-69	2.407e-22	2.326e-71	1.064e-24
0.05	6.434e+12	8.410e-42	3.424e-21	2.240e-44	9.122e-24

DOS File: 10CS4.MS5
Run Date: August 10, 2005
Run Time: 6:15:50 PM
Duration: 00:00:34

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.670e+12	1.714e-30	6.380e-21	3.404e-33	1.267e-23
0.08	6.493e+12	5.130e-20	5.266e-18	8.118e-23	8.333e-21
0.1	7.296e+12	5.385e-16	1.405e-13	8.239e-19	2.149e-16
0.15	8.770e+12	6.346e-12	3.428e-09	1.045e-14	5.646e-12
0.2	5.431e+13	3.014e-09	1.858e-06	5.320e-12	3.280e-09
0.3	4.230e+13	3.921e-07	1.661e-04	7.438e-10	3.151e-07
0.4	1.940e+14	4.945e-05	1.292e-02	9.636e-08	2.517e-05
0.5	4.158e+14	1.223e-03	2.099e-01	2.401e-06	4.120e-04
0.6	3.045e+14	6.097e-03	7.309e-01	1.190e-05	1.427e-03
0.8	3.021e+14	1.091e-01	7.450e+00	2.076e-04	1.417e-02
1.0	2.003e+14	6.072e-01	2.706e+01	1.119e-03	4.988e-02
1.5	1.948e+14	2.072e+01	4.559e+02	3.487e-02	7.670e-01
2.0	3.733e+13	3.610e+01	5.224e+02	5.583e-02	8.078e-01
3.0	6.271e+10	8.464e-01	7.320e+00	1.148e-03	9.930e-03
4.0	9.969e+08	6.319e-02	3.992e-01	7.817e-05	4.938e-04
TOTALS:	1.835e+15	5.846e+01	1.021e+03	9.326e-02	1.651e+00

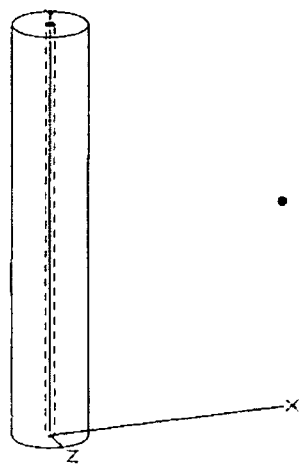
For Information Only

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

Page : 1
DOS File: 10CS8.MS5
[redacted]ate: August 10, 2005
[redacted]time: 6:18:05 PM
Duration: 00:00:34

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 8 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 cm	Iron	7.86

[redacted]

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/cm³	Bq/cm³
Am-241	9.0157e-004	3.3358e+007	1.3510e-003	4.9987e+001
Ba-137m	7.2410e+002	2.6792e+013	1.0851e+003	4.0147e+007
Ba-139	1.2372e+001	4.5778e+011	1.8540e+001	6.8598e+005
Ba-140	6.8135e+002	2.5210e+013	1.0210e+003	3.7777e+007
Ce-141	1.5843e+001	5.8618e+011	2.3740e+001	8.7838e+005
Ce-143	1.2493e+001	4.6223e+011	1.8720e+001	6.9264e+005
Ce-144	1.3373e+001	4.9482e+011	2.0040e+001	7.4148e+005
Cm-242	2.3530e-001	8.7062e+009	3.5260e-001	1.3046e+004
Cm-244	1.3807e-002	5.1087e+008	2.0690e-002	7.6553e+002
Co-58	2.6153e-001	9.6766e+009	3.9190e-001	1.4500e+004
Co-60	1.4114e-001	5.2223e+009	2.1150e-001	7.8255e+003
Cs-134	1.0170e+003	3.7630e+013	1.5240e+003	5.6388e+007
Cs-136	3.1912e+002	1.1807e+013	4.7820e+002	1.7693e+007
Cs-137	7.6544e+002	2.8321e+013	1.1470e+003	4.2439e+007
I-131	5.5202e+003	2.0425e+014	8.2720e+003	3.0606e+008
I-132	2.1769e+003	8.0544e+013	3.2620e+003	1.2069e+008
I-133	9.0358e+003	3.3432e+014	1.3540e+004	5.0098e+008
I-134	2.3310e+001	8.6248e+011	3.4930e+001	1.2924e+006
I-135	4.8402e+003	1.7909e+014	7.2530e+003	2.6836e+008
La-140	8.2483e+001	3.0519e+012	1.2360e+002	4.5732e+006
La-141	1.5362e+000	5.6840e+010	2.3020e+000	8.5174e+004
La-142	1.6910e-001	6.2568e+009	2.5340e-001	9.3758e+003
Mo-99	8.2216e+001	3.0420e+012	1.2320e+002	4.5584e+006
Nb-95	6.7935e+000	2.5136e+011	1.0180e+001	3.7666e+005

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.5165e+000	9.3112e+010	3.7710e+000	1.3953e+005
Np-239	1.7024e+002	6.2988e+012	2.5510e+002	9.4387e+006
Pr-143	5.8092e+000	2.1494e+011	8.7050e+000	3.2208e+005
Pr-144	1.3182e+001	4.8774e+011	1.9753e+001	7.3088e+005
Pu-238	4.0341e-002	1.4926e+009	6.0450e-002	2.2367e+003
Pu-239	4.2883e-003	1.5867e+008	6.4260e-003	2.3776e+002
Pu-240	6.8869e-003	2.5482e+008	1.0320e-002	3.8184e+002
Pu-241	1.6990e+000	6.2865e+010	2.5460e+000	9.4202e+004
Rb-86	9.4829e+000	3.5087e+011	1.4210e+001	5.2577e+005
Rh-103m	7.5544e+001	2.7951e+012	1.1320e+002	4.1885e+006
Rh-105	4.6260e+001	1.7116e+012	6.9320e+001	2.5648e+006
Rh-106	3.0324e+001	1.1220e+012	4.5440e+001	1.6813e+006
Ru-103	7.5743e+001	2.8025e+012	1.1350e+002	4.1995e+006
Ru-105	1.5102e+001	5.5877e+011	2.2630e+001	8.3731e+005
Ru-106	3.0324e+001	1.1220e+012	4.5440e+001	1.6813e+006
Sb-127	7.8346e+001	2.8988e+012	1.1740e+002	4.3438e+006
Sb-129	8.5152e+001	3.1506e+012	1.2760e+002	4.7212e+006
Sr-89	3.6250e+002	1.3412e+013	5.4320e+002	2.0098e+007
Sr-90	4.6407e+001	1.7170e+012	6.9540e+001	2.5730e+006
Sr-91	2.5886e+002	9.5778e+012	3.8790e+002	1.4352e+007
Sr-92	6.3664e+001	2.3556e+012	9.5400e+001	3.5298e+006
Tc-99m	7.6944e+001	2.8469e+012	1.1530e+002	4.2661e+006
Te-127	8.1415e+001	3.0124e+012	1.2200e+002	4.5140e+006
Te-127m	1.4068e+001	5.2050e+011	2.1080e+001	7.7996e+005
Te-129	1.3107e+002	4.8494e+012	1.9640e+002	7.2668e+006
Te-129m	5.8759e+001	2.1741e+012	8.8050e+001	3.2579e+006
Te-131m	1.5816e+002	5.8519e+012	2.3700e+002	8.7690e+006
Te-132	1.2706e+003	4.7013e+013	1.9040e+003	7.0448e+007
Y-90	3.7431e+000	1.3849e+011	5.6090e+000	2.0753e+005
Y-91	5.1952e+000	1.9222e+011	7.7850e+000	2.8805e+005
Y-92	1.0704e+002	3.9605e+012	1.6040e+002	5.9348e+006
Y-93	2.1855e+000	8.0865e+010	3.2750e+000	1.2117e+005
Zr-95	6.7735e-002	2.5062e+009	1.0150e-001	3.7555e+003
Zr-97	4.8442e+000	1.7924e+011	7.2590e+000	2.6858e+005

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.807e+08	0.000e+00	4.953e-27	0.000e+00	4.248e-28
0.02	5.531e+11	0.000e+00	1.536e-23	0.000e+00	5.319e-25
[illegible]3	5.309e+13	1.715e-141	3.259e-21	1.699e-143	3.230e-23
0.04	1.426e+12	5.072e-69	2.322e-22	2.243e-71	1.027e-24
0.05	6.181e+12	8.080e-42	3.290e-21	2.152e-44	8.764e-24

DOS File: 10CS8.MS5
Run Date: August 10, 2005
Run Time: 6:18:05 PM
Duration: 00:00:34

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.640e+12	1.682e-30	6.264e-21	3.342e-33	1.244e-23
0.08	6.354e+12	5.019e-20	5.152e-18	7.943e-23	8.154e-21
0.1	6.914e+12	5.104e-16	1.331e-13	7.808e-19	2.037e-16
0.15	6.968e+12	5.042e-12	2.724e-09	8.302e-15	4.485e-12
0.2	4.964e+13	2.755e-09	1.699e-06	4.862e-12	2.998e-09
0.3	3.611e+13	3.347e-07	1.418e-04	6.349e-10	2.690e-07
0.4	1.811e+14	4.617e-05	1.206e-02	8.997e-08	2.350e-05
0.5	3.436e+14	1.011e-03	1.735e-01	1.984e-06	3.405e-04
0.6	1.978e+14	3.961e-03	4.749e-01	7.731e-06	9.269e-04
0.8	1.810e+14	6.538e-02	4.463e+00	1.244e-04	8.488e-03
1.0	1.270e+14	3.850e-01	1.716e+01	7.096e-04	3.162e-02
1.5	1.251e+14	1.330e+01	2.927e+02	2.238e-02	4.924e-01
2.0	2.276e+13	2.202e+01	3.185e+02	3.404e-02	4.926e-01
3.0	1.104e+11	1.490e+00	1.288e+01	2.021e-03	1.748e-02
4.0	1.642e+08	1.041e-02	6.576e-02	1.288e-05	8.136e-05
TOTALS:	1.347e+15	3.728e+01	6.464e+02	5.931e-02	1.044e+00

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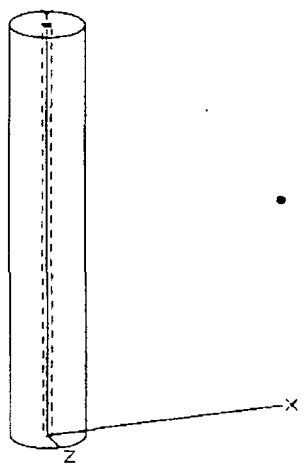
Pennsylvania Power & Light Co.

Page : 1
DOS File: 10CS16.MS5
Date: August 10, 2005
Time: 6:13:07 PM
Duration: 00:00:34

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 16 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241	8.9557e-004	3.3136e+007	1.3420e-003	4.9654e+001
Ba-137m	7.1716e+002	2.6535e+013	1.0747e+003	3.9762e+007
Ba-139	2.1922e-001	8.1112e+009	3.2850e-001	1.2155e+004
Ba-140	6.6280e+002	2.4524e+013	9.9320e+002	3.6748e+007
Ce-141	1.5582e+001	5.7655e+011	2.3350e+001	8.6395e+005
Ce-143	1.0457e+001	3.8692e+011	1.5670e+001	5.7979e+005
Ce-144	1.3233e+001	4.8963e+011	1.9830e+001	7.3371e+005
Cm-242	2.3270e-001	8.6099e+009	3.4870e-001	1.2902e+004
Cm-244	1.3674e-002	5.0593e+008	2.0490e-002	7.5813e+002
Co-58	2.5819e-001	9.5532e+009	3.8690e-001	1.4315e+004
Co-60	1.3981e-001	5.1729e+009	2.0950e-001	7.7515e+003
Cs-134	1.0070e+003	3.7260e+013	1.5090e+003	5.5833e+007
Cs-136	3.1051e+002	1.1489e+013	4.6530e+002	1.7216e+007
Cs-137	7.5810e+002	2.8050e+013	1.1360e+003	4.2032e+007
I-131	5.3154e+003	1.9667e+014	7.9650e+003	2.9470e+008
I-132	1.4047e+003	5.1976e+013	2.1050e+003	7.7885e+007
I-133	6.8536e+003	2.5358e+014	1.0270e+004	3.7999e+008
I-134	4.1335e-002	1.5294e+009	6.1940e-002	2.2918e+003
I-135	2.0714e+003	7.6643e+013	3.1040e+003	1.1485e+008
La-140	1.5749e+002	5.8272e+012	2.3600e+002	8.7320e+006
La-141	3.7097e-001	1.3726e+010	5.5590e-001	2.0568e+004
La-142	4.5900e-003	1.6983e+008	6.8780e-003	2.5449e+002
Mo-99	7.4875e+001	2.7704e+012	1.1220e+002	4.1514e+006
Nb-95	6.7334e+000	2.4914e+011	1.0090e+001	3.7333e+005

DOS File: 10CS16.MS5
Run Date: August 10, 2005
Run Time: 6:13:07 PM
Duration: 00:00:34

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.4405e+000	9.0297e+010	3.6570e+000	1.3531e+005
Np-239	1.5282e+002	5.6544e+012	2.2900e+002	8.4730e+006
Pr-143	5.8479e+000	2.1637e+011	8.7630e+000	3.2423e+005
Pr-144	1.3044e+001	4.8263e+011	1.9546e+001	7.2322e+005
Pu-238	3.9954e-002	1.4783e+009	5.9870e-002	2.2152e+003
Pu-239	4.2516e-003	1.5731e+008	6.3710e-003	2.3573e+002
Pu-240	6.8202e-003	2.5235e+008	1.0220e-002	3.7814e+002
Pu-241	1.6824e+000	6.2247e+010	2.5210e+000	9.3277e+004
Rb-86	9.2760e+000	3.4321e+011	1.3900e+001	5.1430e+005
Rh-103m	7.4412e+001	2.7533e+012	1.1151e+002	4.1257e+006
Rh-105	4.0387e+001	1.4943e+012	6.0520e+001	2.2392e+006
Rh-106	3.0010e+001	1.1104e+012	4.4970e+001	1.6639e+006
Ru-103	7.4608e+001	2.7605e+012	1.1180e+002	4.1366e+006
Ru-105	4.2897e+000	1.5872e+011	6.4280e+000	2.3784e+005
Ru-106	3.0010e+001	1.1104e+012	4.4970e+001	1.6639e+006
Sb-127	7.3074e+001	2.7037e+012	1.0950e+002	4.0515e+006
Sb-129	2.3364e+001	8.6445e+011	3.5010e+001	1.2954e+006
Sr-89	3.5729e+002	1.3220e+013	5.3540e+002	1.9810e+007
Sr-90	4.5960e+001	1.7005e+012	6.8870e+001	2.5482e+006
Sr-91	1.4301e+002	5.2914e+012	2.1430e+002	7.9291e+006
Sr-92	8.1482e+000	3.0148e+011	1.2210e+001	4.5177e+005
Tc-99m	7.2740e+001	2.6914e+012	1.0900e+002	4.0330e+006
Te-127	7.8813e+001	2.9161e+012	1.1810e+002	4.3697e+006
Te-127m	1.3927e+001	5.1531e+011	2.0870e+001	7.7219e+005
Te-129	7.9280e+001	2.9334e+012	1.1880e+002	4.3956e+006
Te-129m	5.7865e+001	2.1410e+012	8.6710e+001	3.2083e+006
Te-131m	1.3020e+002	4.8173e+012	1.9510e+002	7.2187e+006
Te-132	1.1718e+003	4.3358e+013	1.7560e+003	6.4972e+007
Y-90	7.2206e+000	2.6716e+011	1.0820e+001	4.0034e+005
Y-91	5.4462e+000	2.0151e+011	8.1610e+000	3.0196e+005
Y-92	3.9206e+001	1.4506e+012	5.8750e+001	2.1738e+006
Y-93	1.2499e+000	4.6247e+010	1.8730e+000	6.9301e+004
Zr-95	6.6801e+000	2.4716e+011	1.0010e+001	3.7037e+005
Zr-97	3.4555e+000	1.2785e+011	5.1780e+000	1.9159e+005

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.468e+08	0.000e+00	4.354e-27	0.000e+00	3.734e-28
0.02	5.265e+11	0.000e+00	1.462e-23	0.000e+00	5.063e-25
[illegible]3	4.881e+13	1.576e-141	2.996e-21	1.562e-143	2.969e-23
0.04	1.362e+12	4.845e-69	2.218e-22	2.143e-71	9.809e-25
0.05	5.701e+12	7.452e-42	3.034e-21	1.985e-44	8.083e-24

DOS File: 10CS16.MS5
Run Date: August 10, 2005
Run Time: 6:13:07 PM
Duration: 00:00:34

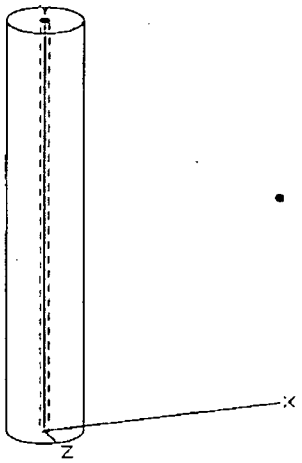
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.581e+12	1.622e-30	6.040e-21	3.222e-33	1.200e-23
0.08	6.089e+12	4.810e-20	4.938e-18	7.612e-23	7.814e-21
0.1	6.221e+12	4.592e-16	1.198e-13	7.025e-19	1.833e-16
0.15	6.480e+12	4.689e-12	2.533e-09	7.722e-15	4.172e-12
0.2	4.384e+13	2.433e-09	1.500e-06	4.294e-12	2.648e-09
0.3	3.051e+13	2.829e-07	1.198e-04	5.366e-10	2.273e-07
0.4	1.682e+14	4.288e-05	1.120e-02	8.356e-08	2.182e-05
0.5	2.576e+14	7.578e-04	1.300e-01	1.487e-06	2.552e-04
0.6	1.568e+14	3.140e-03	3.765e-01	6.130e-06	7.349e-04
0.8	1.349e+14	4.874e-02	3.327e+00	9.270e-05	6.327e-03
1.0	7.040e+13	2.134e-01	9.510e+00	3.934e-04	1.753e-02
1.5	6.324e+13	6.728e+00	1.480e+02	1.132e-02	2.490e-01
2.0	1.041e+13	1.007e+01	1.457e+02	1.558e-02	2.254e-01
3.0	2.075e+11	2.801e+00	2.422e+01	3.800e-03	3.286e-02
4.0	4.458e+06	2.826e-04	1.785e-03	3.496e-07	2.208e-06
TOTALS:	1.013e+15	1.987e+01	3.313e+02	3.119e-02	5.321e-01

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

Page : 1
DOS File: 10CS24.MS5
Date: August 10, 2005
Time: 6:14:43 PM
Duration: 00:00:34

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 24 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241	8.8956e-004	3.2914e+007	1.3330e-003	4.9321e+001
Ba-137m	7.1022e+002	2.6278e+013	1.0643e+003	3.9377e+007
Ba-139	3.8859e-003	1.4378e+008	5.8230e-003	2.1545e+002
Ba-140	6.4458e+002	2.3850e+013	9.6590e+002	3.5738e+007
Ce-141	1.5322e+001	5.6692e+011	2.2960e+001	8.4952e+005
Ce-143	8.7555e+000	3.2395e+011	1.3120e+001	4.8544e+005
Ce-144	1.3100e+001	4.8469e+011	1.9630e+001	7.2631e+005
Cm-242	2.3010e-001	8.5136e+009	3.4480e-001	1.2758e+004
Cm-244	1.3540e-002	5.0099e+008	2.0290e-002	7.5073e+002
Co-58	2.5486e-001	9.4297e+009	3.8190e-001	1.4130e+004
Co-60	1.3841e-001	5.1210e+009	2.0740e-001	7.6738e+003
Cs-134	9.9634e+002	3.6864e+013	1.4930e+003	5.5241e+007
Cs-136	3.0210e+002	1.1178e+013	4.5270e+002	1.6750e+007
Cs-137	7.5076e+002	2.7778e+013	1.1250e+003	4.1625e+007
I-131	5.1178e+003	1.8936e+014	7.6690e+003	2.8375e+008
I-132	1.2913e+003	4.7778e+013	1.9350e+003	7.1595e+007
I-133	5.2012e+003	1.9245e+014	7.7940e+003	2.8838e+008
I-134	7.3274e-005	2.7111e+006	1.0980e-004	4.0626e+000
I-135	8.8689e+002	3.2815e+013	1.3290e+003	4.9173e+007
La-140	2.2029e+002	8.1507e+012	3.3010e+002	1.2214e+007
La-141	8.9624e-002	3.3161e+009	1.3430e-001	4.9691e+003
La-142	1.2459e-004	4.6099e+006	1.8670e-004	6.9079e+000
Mo-99	6.8135e+001	2.5210e+012	1.0210e+002	3.7777e+006
Nb-95	6.6640e+000	2.4657e+011	9.9860e+000	3.6948e+005

DOS File: 10CS24.MS5
Run Date: August 10, 2005
Run Time: 6:14:43 PM
Duration: 00:00:34

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.3664e+000	8.7556e+010	3.5460e+000	1.3120e+005
Np-239	1.3720e+002	5.0766e+012	2.0560e+002	7.6072e+006
Pr-143	5.8552e+000	2.1664e+011	8.7740e+000	3.2464e+005
Pr-144	1.2913e+001	4.7776e+011	1.9349e+001	7.1592e+005
Pu-238	3.9567e-002	1.4640e+009	5.9290e-002	2.1937e+003
Pu-239	4.2142e-003	1.5593e+008	6.3150e-003	2.3366e+002
Pu-240	6.7601e-003	2.5013e+008	1.0130e-002	3.7481e+002
Pu-241	1.6663e+000	6.1655e+010	2.4970e+000	9.2389e+004
Rb-86	9.0691e+000	3.3556e+011	1.3590e+001	5.0283e+005
Rh-103m	7.3281e+001	2.7114e+012	1.0981e+002	4.0630e+006
Rh-105	3.4541e+001	1.2780e+012	5.1760e+001	1.9151e+006
Rh-106	2.9703e+001	1.0990e+012	4.4510e+001	1.6469e+006
Ru-103	7.3474e+001	2.7185e+012	1.1010e+002	4.0737e+006
Ru-105	1.2186e+000	4.5087e+010	1.8260e+000	6.7562e+004
Ru-106	2.9703e+001	1.0990e+012	4.4510e+001	1.6469e+006
Sb-127	6.8135e+001	2.5210e+012	1.0210e+002	3.7777e+006
Sb-129	6.4098e+000	2.3716e+011	9.6050e+000	3.5539e+005
Sr-89	3.5222e+002	1.3032e+013	5.2780e+002	1.9529e+007
Sr-90	4.5513e+001	1.6840e+012	6.8200e+001	2.5234e+006
Sr-91	7.9013e+001	2.9235e+012	1.1840e+002	4.3808e+006
Sr-92	1.0424e+000	3.8568e+010	1.5620e+000	5.7794e+004
Tc-99m	6.8335e+001	2.5284e+012	1.0240e+002	3.7888e+006
Te-127	7.6077e+001	2.8148e+012	1.1400e+002	4.2180e+006
Te-127m	1.3794e+001	5.1037e+011	2.0670e+001	7.6479e+005
Te-129	5.8232e+001	2.1546e+012	8.7260e+001	3.2286e+006
Te-129m	5.6931e+001	2.1064e+012	8.5310e+001	3.1565e+006
Te-131m	1.0717e+002	3.9655e+012	1.6060e+002	5.9422e+006
Te-132	1.0811e+003	4.0000e+013	1.6200e+003	5.9940e+007
Y-90	1.0357e+001	3.8321e+011	1.5520e+001	5.7424e+005
Y-91	5.5503e+000	2.0536e+011	8.3170e+000	3.0773e+005
Y-92	1.0424e+001	3.8568e+011	1.5620e+001	5.7794e+005
Y-93	7.1472e-001	2.6445e+010	1.0710e+000	3.9627e+004
Zr-95	6.5940e+000	2.4398e+011	9.8810e+000	3.6560e+005
Zr-97	2.4651e+000	9.1211e+010	3.6940e+000	1.3668e+005

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.263e+08	0.000e+00	3.992e-27	0.000e+00	3.424e-28
0.02	5.017e+11	0.000e+00	1.393e-23	0.000e+00	4.824e-25
[illegible]3	4.537e+13	1.465e-141	2.785e-21	1.452e-143	2.760e-23
0.04	1.308e+12	4.653e-69	2.130e-22	2.058e-71	9.418e-25
0.05	5.260e+12	6.876e-42	2.800e-21	1.832e-44	7.458e-24

DOS File: 10CS24.MS5
Run Date: August 10, 2005
Run Time: 6:14:43 PM
Duration: 00:00:34

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.526e+12	1.566e-30	5.829e-21	3.110e-33	1.158e-23
0.08	5.840e+12	4.614e-20	4.736e-18	7.301e-23	7.495e-21
0.1	5.607e+12	4.139e-16	1.080e-13	6.332e-19	1.652e-16
0.15	6.182e+12	4.473e-12	2.417e-09	7.366e-15	3.979e-12
0.2	3.967e+13	2.202e-09	1.358e-06	3.886e-12	2.396e-09
0.3	2.786e+13	2.583e-07	1.094e-04	4.900e-10	2.076e-07
0.4	1.595e+14	4.067e-05	1.062e-02	7.923e-08	2.070e-05
0.5	1.995e+14	5.871e-04	1.007e-01	1.152e-06	1.977e-04
0.6	1.485e+14	2.974e-03	3.566e-01	5.805e-06	6.960e-04
0.8	1.208e+14	4.366e-02	2.980e+00	8.304e-05	5.668e-03
1.0	4.786e+13	1.451e-01	6.466e+00	2.675e-04	1.192e-02
1.5	3.909e+13	4.158e+00	9.147e+01	6.996e-03	1.539e-01
2.0	5.424e+12	5.246e+00	7.591e+01	8.112e-03	1.174e-01
3.0	2.902e+11	3.917e+00	3.387e+01	5.314e-03	4.596e-02
4.0	1.210e+05	7.670e-06	4.845e-05	9.489e-09	5.994e-08
TOTALS:	8.602e+14	1.351e+01	2.112e+02	2.078e-02	3.357e-01

For Information Only

MicroShield v5.01 (5.01-00076)
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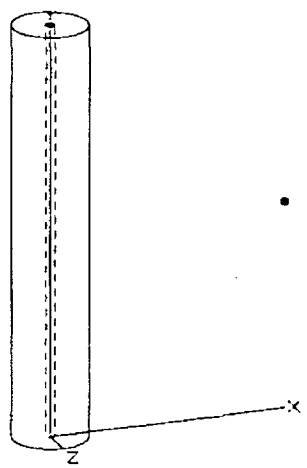
Page : 1
DOS File: 10CS48.MS5
Date: August 30, 2005
Time: 4:23:05 PM
Duration: 00:00:34

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 48 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241	8.7088e-004	3.2222e+007	1.3050e-003	4.8285e+001
Ba-137m	6.9001e+002	2.5531e+013	1.0340e+003	3.8257e+007
Ba-139	2.1635e-008	8.0050e+002	3.2420e-008	1.1995e-003
Ba-140	5.9293e+002	2.1938e+013	8.8850e+002	3.2874e+007
Ce-141	1.4568e+001	5.3902e+011	2.1830e+001	8.0771e+005
Ce-143	5.1365e+000	1.9005e+011	7.6970e+000	2.8479e+005
Ce-144	1.2693e+001	4.6963e+011	1.9020e+001	7.0374e+005
Cm-242	2.2256e-001	8.2346e+009	3.3350e-001	1.2339e+004
Cm-244	1.3153e-002	4.8667e+008	1.9710e-002	7.2927e+002
Co-58	2.4511e-001	9.0692e+009	3.6730e-001	1.3590e+004
Co-60	1.3440e-001	4.9729e+009	2.0140e-001	7.4518e+003
Cs-134	9.6697e+002	3.5778e+013	1.4490e+003	5.3613e+007
Cs-136	2.7828e+002	1.0296e+013	4.1700e+002	1.5429e+007
Cs-137	7.2940e+002	2.6988e+013	1.0930e+003	4.0441e+007
I-131	4.5653e+003	1.6891e+014	6.8410e+003	2.5312e+008
I-132	1.0130e+003	3.7482e+013	1.5180e+003	5.6166e+007
I-133	2.2703e+003	8.4001e+013	3.4020e+003	1.2587e+008
I-134	4.0854e-013	1.5116e-002	6.1220e-013	2.2651e-008
I-135	6.9537e+001	2.5729e+012	1.0420e+002	3.8554e+006
La-140	3.4915e+002	1.2919e+013	5.2320e+002	1.9358e+007
La-141	1.2626e-003	4.6716e+007	1.8920e-003	7.0004e+001
La-142	2.4918e-009	9.2198e+001	3.7340e-009	1.3816e-004
Mo-99	5.1452e+001	1.9037e+012	7.7100e+001	2.8527e+006
Nb-95	6.4692e+000	2.3936e+011	9.6940e+000	3.5868e+005

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.1582e+000	7.9852e+010	3.2340e+000	1.1966e+005
Np-239	9.9300e+001	3.6741e+012	1.4880e+002	5.5056e+006
Pr-143	5.7358e+000	2.1222e+011	8.5950e+000	3.1802e+005
Pr-144	1.2511e+001	4.6292e+011	1.8748e+001	6.9368e+005
Pu-238	3.8432e-002	1.4220e+009	5.7590e-002	2.1308e+003
Pu-239	4.1021e-003	1.5178e+008	6.1470e-003	2.2744e+002
Pu-240	6.5633e-003	2.4284e+008	9.8350e-003	3.6390e+002
Pu-241	1.6183e+000	5.9877e+010	2.4250e+000	8.9725e+004
Rb-86	8.4885e+000	3.1408e+011	1.2720e+001	4.7064e+005
Rh-103m	6.9886e+001	2.5858e+012	1.0472e+002	3.8748e+006
Rh-105	2.1061e+001	7.7926e+011	3.1560e+001	1.1677e+006
Rh-106	2.8796e+001	1.0654e+012	4.3150e+001	1.5966e+006
Ru-103	7.0071e+001	2.5926e+012	1.0500e+002	3.8850e+006
Ru-105	2.7921e-002	1.0331e+009	4.1840e-002	1.5481e+003
Ru-106	2.8796e+001	1.0654e+012	4.3150e+001	1.5966e+006
Sb-127	5.5276e+001	2.0452e+012	8.2830e+001	3.0647e+006
Sb-129	1.3233e-001	4.8963e+009	1.9830e-001	7.3371e+003
Sr-89	3.3747e+002	1.2487e+013	5.0570e+002	1.8711e+007
Sr-90	4.4198e+001	1.6353e+012	6.6230e+001	2.4505e+006
Sr-91	1.3320e+001	4.9284e+011	1.9960e+001	7.3852e+005
Sr-92	2.1855e-003	8.0865e+007	3.2750e-003	1.2117e+002
Tc-99m	5.2653e+001	1.9482e+012	7.8900e+001	2.9193e+006
Te-127	6.5533e+001	2.4247e+012	9.8200e+001	3.6334e+006
Te-127m	1.3380e+001	4.9507e+011	2.0050e+001	7.4185e+005
Te-129	4.7027e+001	1.7400e+012	7.0470e+001	2.6074e+006
Te-129m	5.4175e+001	2.0045e+012	8.1180e+001	3.0037e+006
Te-131m	5.9787e+001	2.2121e+012	8.9590e+001	3.3148e+006
Te-132	8.4885e+002	3.1408e+013	1.2720e+003	4.7064e+007
Y-90	1.7931e+001	6.6346e+011	2.6870e+001	9.9419e+005
Y-91	5.5062e+000	2.0373e+011	8.2510e+000	3.0529e+005
Y-92	1.1752e-001	4.3482e+009	1.7610e-001	6.5157e+003
Y-93	1.3373e-001	4.9482e+009	2.0040e-001	7.4148e+003
Zr-95	6.3357e+000	2.3442e+011	9.4940e+000	3.5128e+005
Zr-97	8.9490e-001	3.3111e+010	1.3410e+000	4.9617e+004

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.004e+08	0.000e+00	3.536e-27	0.000e+00	3.033e-28
0.02	4.269e+11	0.000e+00	1.185e-23	0.000e+00	4.106e-25
[illegible]	3.724e+13	1.203e-141	2.286e-21	1.192e-143	2.266e-23
0.04	1.177e+12	4.186e-69	1.916e-22	1.851e-71	8.473e-25
0.05	4.132e+12	5.401e-42	2.199e-21	1.439e-44	5.858e-24

DOS File: 10CS48.MS5
Run Date: August 30, 2005
Run Time: 4:23:05 PM
Duration: 00:00:34

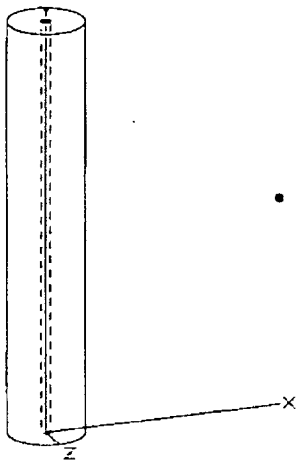
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.378e+12	1.414e-30	5.264e-21	2.808e-33	1.046e-23
0.08	5.173e+12	4.087e-20	4.195e-18	6.467e-23	6.639e-21
0.1	4.129e+12	3.047e-16	7.949e-14	4.662e-19	1.216e-16
0.15	5.278e+12	3.819e-12	2.063e-09	6.289e-15	3.397e-12
0.2	3.076e+13	1.707e-09	1.053e-06	3.013e-12	1.858e-09
0.3	2.414e+13	2.238e-07	9.479e-05	4.245e-10	1.798e-07
0.4	1.404e+14	3.580e-05	9.350e-03	6.975e-08	1.822e-05
0.5	9.975e+13	2.935e-04	5.036e-02	5.761e-07	9.885e-05
0.6	1.296e+14	2.594e-03	3.110e-01	5.063e-06	6.071e-04
0.8	9.702e+13	3.505e-02	2.393e+00	6.667e-05	4.551e-03
1.0	2.769e+13	8.395e-02	3.741e+00	1.548e-04	6.896e-03
1.5	2.276e+13	2.422e+00	5.327e+01	4.075e-03	8.963e-02
2.0	1.720e+12	1.664e+00	2.407e+01	2.573e-03	3.722e-02
3.0	4.600e+11	6.209e+00	5.369e+01	8.423e-03	7.284e-02
4.0	2.420e+00	1.534e-10	9.691e-10	1.898e-13	1.199e-12
TOTALS:	6.332e+14	1.042e+01	1.375e+02	1.530e-02	2.119e-01

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

Page : 1
DOS File: 10CS96.MS5
Date: August 10, 2005
Time: 6:18:40 PM
Duration: 00:00:33

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 96 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241	8.3484e-004	3.0889e+007	1.2510e-003	4.6287e+001
Ba-137m	6.5087e+002	2.4082e+013	9.7533e+002	3.6087e+007
Ba-139				
Ba-140	5.0164e+002	1.8561e+013	7.5170e+002	2.7813e+007
Ce-141	1.3173e+001	4.8741e+011	1.9740e+001	7.3038e+005
Ce-143	1.7678e+000	6.5408e+010	2.6490e+000	9.8013e+004
Ce-144	1.1912e+001	4.4074e+011	1.7850e+001	6.6045e+005
Cm-242	2.0814e-001	7.7013e+009	3.1190e-001	1.1540e+004
Cm-244	1.2399e-002	4.5877e+008	1.8580e-002	6.8746e+002
Co-58	2.2669e-001	8.3877e+009	3.3970e-001	1.2569e+004
Co-60	1.2666e-001	4.6865e+009	1.8980e-001	7.0226e+003
Cs-134	9.1092e+002	3.3704e+013	1.3650e+003	5.0505e+007
Cs-136	2.3617e+002	8.7383e+012	3.5390e+002	1.3094e+007
Cs-137	6.8803e+002	2.5457e+013	1.0310e+003	3.8147e+007
I-131	3.6283e+003	1.3425e+014	5.4370e+003	2.0117e+008
I-132	6.2456e+002	2.3109e+013	9.3590e+002	3.4628e+007
I-133	4.3257e+002	1.6005e+013	6.4820e+002	2.3983e+007
I-134				
I-135	4.2736e-001	1.5812e+010	6.4040e-001	2.3695e+004
La-140	4.4251e+002	1.6373e+013	6.6310e+002	2.4535e+007
La-141	2.5079e-007	9.2791e+003	3.7580e-007	1.3905e-002
La-142				
Mo-99	2.9316e+001	1.0847e+012	4.3930e+001	1.6254e+006
Nb-95	6.0935e+000	2.2546e+011	9.1310e+000	3.3785e+005

DOS File: 10CS96.MS5
Run Date: August 10, 2005
Run Time: 6:18:40 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	1.7938e+000	6.6371e+010	2.6880e+000	9.9456e+004
Np-239	5.1986e+001	1.9235e+012	7.7900e+001	2.8823e+006
Pr-143	5.1792e+000	1.9163e+011	7.7610e+000	2.8716e+005
Pr-144	1.1742e+001	4.3444e+011	1.7595e+001	6.5101e+005
Pu-238	3.6263e-002	1.3417e+009	5.4340e-002	2.0106e+003
Pu-239	3.8806e-003	1.4358e+008	5.8150e-003	2.1516e+002
Pu-240	6.1909e-003	2.2906e+008	9.2770e-003	3.4325e+002
Pu-241	1.5262e+000	5.6470e+010	2.2870e+000	8.4619e+004
Rb-86	7.4342e+000	2.7506e+011	1.1140e+001	4.1218e+005
Rh-103m	6.3650e+001	2.3550e+012	9.5378e+001	3.5290e+006
Rh-105	7.7545e+000	2.8692e+011	1.1620e+001	4.2994e+005
Rh-106	2.7061e+001	1.0012e+012	4.0550e+001	1.5003e+006
Ru-103	6.3818e+001	2.3613e+012	9.5630e+001	3.5383e+006
Ru-105	1.4661e-005	5.4247e+005	2.1970e-005	8.1289e-001
Ru-106	2.7061e+001	1.0012e+012	4.0550e+001	1.5003e+006
Sb-127	3.6377e+001	1.3459e+012	5.4510e+001	2.0169e+006
Sb-129	5.6450e-005	2.0887e+006	8.4590e-005	3.1298e+000
Sr-89	3.0971e+002	1.1459e+013	4.6410e+002	1.7172e+007
Sr-90	4.1689e+001	1.5425e+012	6.2470e+001	2.3114e+006
Sr-91	3.7858e-001	1.4008e+010	5.6730e-001	2.0990e+004
Sr-92	9.6030e-009	3.5531e+002	1.4390e-008	5.3243e-004
Tc-99m	3.0057e+001	1.1121e+012	4.5040e+001	1.6665e+006
Te-127	4.7214e+001	1.7469e+012	7.0750e+001	2.6178e+006
Te-127m	1.2559e+001	4.6469e+011	1.8820e+001	6.9634e+005
Te-129	4.2403e+001	1.5689e+012	6.3540e+001	2.3510e+006
Te-129m	4.9036e+001	1.8143e+012	7.3480e+001	2.7188e+006
Te-131m	1.8605e+001	6.8840e+011	2.7880e+001	1.0316e+006
Te-132	5.2326e+002	1.9361e+013	7.8410e+002	2.9012e+007
Y-90	2.7047e+001	1.0007e+012	4.0530e+001	1.4996e+006
Y-91	5.1065e+000	1.8894e+011	7.6520e+000	2.8312e+005
Y-92	9.7632e-006	3.6124e+005	1.4630e-005	5.4131e-001
Y-93	4.6800e-003	1.7316e+008	7.0130e-003	2.5948e+002
Zr-95	5.8486e+000	2.1640e+011	8.7640e+000	3.2427e+005
Zr-97	1.1785e-001	4.3605e+009	1.7660e-001	6.5342e+003

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.846e+08	0.000e+00	3.257e-27	0.000e+00	2.794e-28
0.02	3.184e+11	0.000e+00	8.839e-24	0.000e+00	3.062e-25
[illegible]3	2.613e+13	8.440e-142	1.604e-21	8.365e-144	1.590e-23
0.04	9.983e+11	3.551e-69	1.625e-22	1.570e-71	7.188e-25
0.05	2.549e+12	3.332e-42	1.357e-21	8.877e-45	3.614e-24

DOS File: 10CS96.MS5
Run Date: August 10, 2005
Run Time: 6:18:40 PM
Duration: 00:00:33

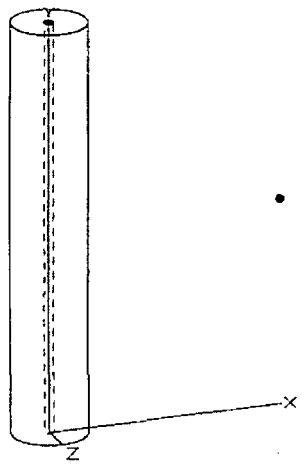
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.140e+12	1.169e-30	4.353e-21	2.323e-33	8.647e-24
0.08	4.101e+12	3.240e-20	3.326e-18	5.127e-23	5.263e-21
0.1	2.279e+12	1.682e-16	4.388e-14	2.573e-19	6.713e-17
0.15	3.932e+12	2.845e-12	1.537e-09	4.685e-15	2.531e-12
0.2	1.921e+13	1.066e-09	6.573e-07	1.882e-12	1.160e-09
0.3	1.985e+13	1.840e-07	7.793e-05	3.490e-10	1.478e-07
0.4	1.112e+14	2.835e-05	7.406e-03	5.525e-08	1.443e-05
0.5	3.584e+13	1.055e-04	1.809e-02	2.070e-07	3.552e-05
0.6	1.034e+14	2.070e-03	2.481e-01	4.040e-06	4.844e-04
0.8	7.308e+13	2.640e-02	1.802e+00	5.022e-05	3.428e-03
1.0	1.888e+13	5.722e-02	2.550e+00	1.055e-04	4.700e-03
1.5	2.066e+13	2.198e+00	4.836e+01	3.698e-03	8.136e-02
2.0	9.322e+11	9.017e-01	1.305e+01	1.394e-03	2.018e-02
3.0	5.830e+11	7.869e+00	6.805e+01	1.068e-02	9.232e-02
TOTALS:	4.451e+14	1.105e+01	1.341e+02	1.593e-02	2.025e-01

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

Page : 1
DOS File: 10CS240.MS5
Date: August 10, 2005
Time: 6:15:17 PM
Duration: 00:00:33

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 240 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241	7.3474e-004	2.7185e+007	1.1010e-003	4.0737e+001
Ba-137m	5.4595e+002	2.0200e+013	8.1810e+002	3.0270e+007
Ba-139				
Ba-140	3.0384e+002	1.1242e+013	4.5530e+002	1.6846e+007
Ce-141	9.7298e+000	3.6000e+011	1.4580e+001	5.3946e+005
Ce-143	7.2073e-002	2.6667e+009	1.0800e-001	3.9960e+003
Ce-144	9.8566e+000	3.6469e+011	1.4770e+001	5.4649e+005
Cm-242	1.7030e-001	6.3013e+009	2.5520e-001	9.4424e+003
Cm-244	1.0404e-002	3.8494e+008	1.5590e-002	5.7683e+002
Co-58	1.7945e-001	6.6396e+009	2.6890e-001	9.9493e+003
Co-60	1.0611e-001	3.9260e+009	1.5900e-001	5.8830e+003
Cs-134	7.6010e+002	2.8124e+013	1.1390e+003	4.2143e+007
Cs-136	1.4435e+002	5.3408e+012	2.1630e+002	8.0031e+006
Cs-137	5.7711e+002	2.1353e+013	8.6480e+002	3.1998e+007
I-131	1.8172e+003	6.7235e+013	2.7230e+003	1.0075e+008
I-132	1.4628e+002	5.4124e+012	2.1920e+002	8.1104e+006
I-133	2.9923e+000	1.1072e+011	4.4840e+000	1.6591e+005
I-134				
I-135	9.9233e-008	3.6716e+003	1.4870e-007	5.5019e-003
La-140	3.4301e+002	1.2691e+013	5.1400e+002	1.9018e+007
La-141				
La-142				
Mo-99	5.4241e+000	2.0069e+011	8.1280e+000	3.0074e+005
Nb-95	5.0691e+000	1.8756e+011	7.5960e+000	2.8105e+005

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Run Date: August 10, 2005
Run Time: 6:15:17 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	1.0310e+000	3.8148e+010	1.5450e+000	5.7165e+004
Np-239	7.4608e+000	2.7605e+011	1.1180e+001	4.1366e+005
Pr-143	3.3147e+000	1.2264e+011	4.9670e+000	1.8378e+005
Pr-144	9.7156e+000	3.5948e+011	1.4559e+001	5.3868e+005
Pu-238	3.0457e-002	1.1269e+009	4.5640e-002	1.6887e+003
Pu-239	3.2673e-003	1.2089e+008	4.8960e-003	1.8115e+002
Pu-240	5.1972e-003	1.9230e+008	7.7880e-003	2.8816e+002
Pu-241	1.2800e+000	4.7358e+010	1.9180e+000	7.0966e+004
Rb-86	4.9950e+000	1.8482e+011	7.4850e+000	2.7695e+005
Rh-103m	4.8062e+001	1.7783e+012	7.2020e+001	2.6647e+006
Rh-105	3.8699e-001	1.4319e+010	5.7990e-001	2.1456e+004
Rh-106	2.2463e+001	8.3112e+011	3.3660e+001	1.2454e+006
Ru-103	4.8189e+001	1.7830e+012	7.2210e+001	2.6718e+006
Ru-105	2.1235e-015	7.8568e-005	3.1820e-015	1.1773e-010
Ru-106	2.2463e+001	8.3112e+011	3.3660e+001	1.2454e+006
Sb-127	1.0364e+001	3.8346e+011	1.5530e+001	5.7461e+005
Sb-129	4.3784e-015	1.6200e-004	6.5610e-015	2.4276e-010
Sr-89	2.3944e+002	8.8593e+012	3.5880e+002	1.3276e+007
Sr-90	3.4982e+001	1.2943e+012	5.2420e+001	1.9395e+006
Sr-91	8.6954e-006	3.2173e+005	1.3030e-005	4.8211e-001
Sr-92				
Tc-99m	5.5609e+000	2.0575e+011	8.3330e+000	3.0832e+005
Te-127	2.0294e+001	7.5087e+011	3.0410e+001	1.1252e+006
Te-127m	1.0277e+001	3.8025e+011	1.5400e+001	5.6980e+005
Te-129	3.1452e+001	1.1637e+012	4.7130e+001	1.7438e+006
Te-129m	3.6370e+001	1.3457e+012	5.4500e+001	2.0165e+006
Te-131m	5.6056e-001	2.0741e+010	8.4000e-001	3.1080e+004
Te-132	1.2259e+002	4.5358e+012	1.8370e+002	6.7969e+006
Y-90	3.2559e+001	1.2047e+012	4.8790e+001	1.8052e+006
Y-91	3.9934e+000	1.4775e+011	5.9840e+000	2.2141e+005
Y-92				
Y-93	2.0060e-007	7.4223e+003	3.0060e-007	1.1122e-002
Zr-95	4.6006e+000	1.7022e+011	6.8940e+000	2.5508e+005
Zr-97	2.6934e-004	9.9655e+006	4.0360e-004	1.4933e+001

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.534e+08	0.000e+00	2.707e-27	0.000e+00	2.322e-28
0.02	1.737e+11	0.000e+00	4.824e-24	0.000e+00	1.671e-25
[illegible]3	1.089e+13	3.517e-142	6.685e-22	3.485e-144	6.625e-24
0.04	6.965e+11	2.477e-69	1.134e-22	1.096e-71	5.015e-25
0.05	6.017e+11	7.865e-43	3.202e-22	2.095e-45	8.531e-25

DOS File: 10CS240.MS5
Run Date: August 10, 2005
Run Time: 6:15:17 PM
Duration: 00:00:33

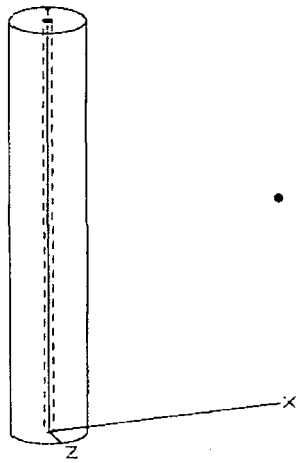
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	6.764e+11	6.940e-31	2.584e-21	1.378e-33	5.132e-24
0.08	2.103e+12	1.661e-20	1.705e-18	2.629e-23	2.699e-21
0.1	4.395e+11	3.244e-17	8.462e-15	4.963e-20	1.295e-17
0.15	1.966e+12	1.422e-12	7.685e-10	2.342e-15	1.265e-12
0.2	5.046e+12	2.801e-10	1.727e-07	4.943e-13	3.048e-10
0.3	1.113e+13	1.031e-07	4.369e-05	1.957e-10	8.289e-08
0.4	5.571e+13	1.420e-05	3.709e-03	2.767e-08	7.227e-06
0.5	1.273e+13	3.745e-05	6.426e-03	7.351e-08	1.261e-05
0.6	6.470e+13	1.295e-03	1.553e-01	2.529e-06	3.032e-04
0.8	4.293e+13	1.551e-02	1.059e+00	2.950e-05	2.014e-03
1.0	9.122e+12	2.765e-02	1.232e+00	5.097e-05	2.272e-03
1.5	1.382e+13	1.471e+00	3.235e+01	2.475e-03	5.443e-02
2.0	2.895e+11	2.800e-01	4.052e+00	4.330e-04	6.265e-03
3.0	4.519e+11	6.099e+00	5.275e+01	8.275e-03	7.156e-02
TOTALS:	2.335e+14	7.895e+00	9.161e+01	1.127e-02	1.369e-01

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

Page : 1
DOS File: 10CS480.MS5
Date: August 10, 2005
Time: 6:16:59 PM
Duration: 00:00:33

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 480 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241	5.9066e-004	2.1854e+007	8.8510e-004	3.2749e+001
Ba-137m	4.0751e+002	1.5078e+013	6.1064e+002	2.2594e+007
Ba-139				
Ba-140	1.3173e+002	4.8741e+012	1.9740e+002	7.3038e+006
Ce-141	5.8712e+000	2.1724e+011	8.7980e+000	3.2553e+005
Ce-143	3.4828e-004	1.2887e+007	5.2190e-004	1.9310e+001
Ce-144	7.1806e+000	2.6568e+011	1.0760e+001	3.9812e+005
Cm-242	1.2192e-001	4.5111e+009	1.8270e-001	6.7599e+003
Cm-244	7.7611e-003	2.8716e+008	1.1630e-002	4.3031e+002
Co-58	1.2152e-001	4.4963e+009	1.8210e-001	6.7377e+003
Co-60	7.9013e-002	2.9235e+009	1.1840e-001	4.3808e+003
Cs-134	5.6263e+002	2.0817e+013	8.4310e+002	3.1195e+007
Cs-136	6.3511e+001	2.3499e+012	9.5170e+001	3.5213e+006
Cs-137	4.3077e+002	1.5938e+013	6.4550e+002	2.3884e+007
I-131	5.7318e+002	2.1208e+013	8.5890e+002	3.1779e+007
I-132	1.3020e+001	4.8173e+011	1.9510e+001	7.2187e+005
I-133	7.5142e-004	2.7803e+007	1.1260e-003	4.1662e+001
I-134				
I-135				
La-140	1.5289e+002	5.6568e+012	2.2910e+002	8.4767e+006
La-141				
La-142				
Mo-99	3.2586e-001	1.2057e+010	4.8830e-001	1.8067e+004
Nb-95	3.6850e+000	1.3635e+011	5.5220e+000	2.0431e+005

DOS File: 10CS480.MS5
Run Date: August 10, 2005
Run Time: 6:16:59 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	4.0975e-001	1.5161e+010	6.1400e-001	2.2718e+004
Np-239	2.9376e-001	1.0869e+010	4.4020e-001	1.6287e+004
Pr-143	1.4888e+000	5.5087e+010	2.2310e+000	8.2547e+004
Pr-144	7.0779e+000	2.6188e+011	1.0606e+001	3.9243e+005
Pu-238	2.2776e-002	8.4272e+008	3.4130e-002	1.2628e+003
Pu-239	2.4418e-003	9.0346e+007	3.6590e-003	1.3538e+002
Pu-240	3.8819e-003	1.4363e+008	5.8170e-003	2.1523e+002
Pu-241	9.5496e-001	3.5334e+010	1.4310e+000	5.2947e+004
Rb-86	2.5733e+000	9.5211e+010	3.8560e+000	1.4267e+005
Rh-103m	3.0091e+001	1.1134e+012	4.5091e+001	1.6684e+006
Rh-105	2.6173e-003	9.6840e+007	3.9220e-003	1.4511e+002
Rh-106	1.6463e+001	6.0914e+011	2.4670e+001	9.1279e+005
Ru-103	3.0170e+001	1.1163e+012	4.5210e+001	1.6728e+006
Ru-105				
Ru-106	1.6463e+001	6.0914e+011	2.4670e+001	9.1279e+005
Sb-127	1.2793e+000	4.7334e+010	1.9170e+000	7.0929e+004
Sb-129				
Sr-89	1.5589e+002	5.7679e+012	2.3360e+002	8.6432e+006
Sr-90	2.6113e+001	9.6618e+011	3.9130e+001	1.4478e+006
Sr-91	1.6123e-013	5.9655e-003	2.4160e-013	8.9392e-009
Sr-92				
Tc-99m	3.3407e-001	1.2361e+010	5.0060e-001	1.8522e+004
Te-127	8.6020e+000	3.1827e+011	1.2890e+001	4.7693e+005
Te-127m	7.2406e+000	2.6790e+011	1.0850e+001	4.0145e+005
Te-129	1.9113e+001	7.0717e+011	2.8640e+001	1.0597e+006
Te-129m	2.2102e+001	8.1778e+011	3.3120e+001	1.2254e+006
Te-131m	1.6356e-003	6.0519e+007	2.4510e-003	9.0687e+001
Te-132	1.0911e+001	4.0371e+011	1.6350e+001	6.0495e+005
Y-90	2.6120e+001	9.6643e+011	3.9140e+001	1.4482e+006
Y-91	2.6493e+000	9.8025e+010	3.9700e+000	1.4689e+005
Y-92				
Y-93	1.0531e-014	3.8963e-004	1.5780e-014	5.8386e-010
Zr-95	3.0838e+000	1.1410e+011	4.6210e+000	1.7098e+005
Zr-97	1.0684e-008	3.9531e+002	1.6010e-008	5.9237e-004

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.116e+08	0.000e+00	1.968e-27	0.000e+00	1.688e-28
0.02	9.663e+10	0.000e+00	2.683e-24	0.000e+00	9.293e-26
0.03	3.890e+12	1.256e-142	2.388e-22	1.245e-144	2.367e-24
0.04	4.222e+11	1.502e-69	6.874e-23	6.642e-72	3.040e-25
0.05	5.711e+10	7.466e-44	3.040e-23	1.989e-46	8.097e-26

DOS File: 10CS480.MS5
Run Date: August 10, 2005
Run Time: 6:16:59 PM
Duration: 00:00:33

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.950e+11	3.027e-31	1.127e-21	6.013e-34	2.239e-24
0.08	7.073e+11	5.588e-21	5.736e-19	8.843e-24	9.077e-22
0.1	5.253e+10	3.877e-18	1.011e-15	5.931e-21	1.547e-18
0.15	8.221e+11	5.949e-13	3.214e-10	9.796e-16	5.292e-13
0.2	7.726e+11	4.288e-11	2.644e-08	7.568e-14	4.666e-11
0.3	4.281e+12	3.969e-08	1.681e-05	7.529e-11	3.189e-08
0.4	1.766e+13	4.501e-06	1.176e-03	8.770e-09	2.291e-06
0.5	5.540e+12	1.630e-05	2.797e-03	3.200e-08	5.490e-06
0.6	4.123e+13	8.256e-04	9.899e-02	1.612e-06	1.932e-04
0.8	2.496e+13	9.017e-03	6.155e-01	1.715e-05	1.171e-03
1.0	3.706e+12	1.123e-02	5.006e-01	2.071e-05	9.227e-04
1.5	6.117e+12	6.508e-01	1.432e+01	1.095e-03	2.409e-02
2.0	6.599e+10	6.383e-02	9.236e-01	9.870e-05	1.428e-03
3.0	2.014e+11	2.719e+00	2.351e+01	3.688e-03	3.190e-02
TOTALS:	1.109e+14	3.454e+00	3.997e+01	4.922e-03	5.971e-02

For Information Only

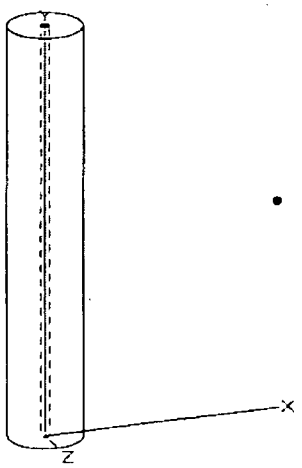
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
DOS File: 10CS720.MS5
Date: August 30, 2005
Time: 1:24:43 PM
Duration: 00:00:32

EC-RADN-1129
PAGE 337

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

Case Title: Control Room
Description: AST - 10 GBB-103; Time = 720 hr
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.3e+3 cm	43 ft 0.4 in
Radius	12.725 cm	5.0 in

Dose Points

	X	Y	Z
# 1	732.3328 cm	655.8788 cm	0 cm
	24 ft 0.3 in	21 ft 6.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	6.67e+05 cm³	Water	1
Shield 1	101.346 cm	Concrete	2.35
Transition		Air	0.00122
Air Gap		Air	0.00122
Wall Clad	.927 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/cm³	Bq/cm³
Am-241	4.7248e-004	1.7482e+007	7.0800e-004	2.6196e+001
Ba-137m	3.0422e+002	1.1256e+013	4.5588e+002	1.6867e+007
Ba-139				
Ba-140	5.7104e+001	2.1129e+012	8.5570e+001	3.1661e+006
Ce-141	3.5436e+000	1.3111e+011	5.3100e+000	1.9647e+005
Ce-143	1.6824e-006	6.2247e+004	2.5210e-006	9.3277e-002
Ce-144	5.2373e+000	1.9378e+011	7.8480e+000	2.9038e+005
Cm-242	8.7288e-002	3.2297e+009	1.3080e-001	4.8396e+003
Cm-244	5.7938e-003	2.1437e+008	8.6820e-003	3.2123e+002
Co-58	8.2350e-002	3.0469e+009	1.2340e-001	4.5658e+003
Co-60	5.8786e-002	2.1751e+009	8.8090e-002	3.2593e+003
Cs-134	4.1649e+002	1.5410e+013	6.2410e+002	2.3092e+007
Cs-136	2.7948e+001	1.0341e+012	4.1880e+001	1.5496e+006
Cs-137	3.2159e+002	1.1899e+013	4.8190e+002	1.7830e+007
I-131	1.8078e+002	6.6889e+012	2.7090e+002	1.0023e+007
I-132	1.1592e+000	4.2889e+010	1.7370e+000	6.4269e+004
I-133	1.8872e-007	6.9828e+003	2.8280e-007	1.0464e-002
I-134				
I-135				
La-140	6.6327e+001	2.4541e+012	9.9390e+001	3.6774e+006
La-141				
La-142				
Mo-99	1.9573e-002	7.2420e+008	2.9330e-002	1.0852e+003
Nb-95	2.6460e+000	9.7902e+010	3.9650e+000	1.4671e+005

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	1.6283e-001	6.0247e+009	2.4400e-001	9.0280e+003
Np-239	1.1565e-002	4.2790e+008	1.7330e-002	6.4121e+002
Pr-143	6.6701e-001	2.4679e+010	9.9950e-001	3.6982e+004
Pr-144	5.1624e+000	1.9101e+011	7.7358e+000	2.8622e+005
Pu-238	1.7030e-002	6.3013e+008	2.5520e-002	9.4424e+002
Pu-239	1.8238e-003	6.7482e+007	2.7330e-003	1.0112e+002
Pu-240	2.8996e-003	1.0728e+008	4.3450e-003	1.6077e+002
Pu-241	7.1205e-001	2.6346e+010	1.0670e+000	3.9479e+004
Rb-86	1.3260e+000	4.9062e+010	1.9870e+000	7.3519e+004
Rh-103m	1.8843e+001	6.9718e+011	2.8236e+001	1.0447e+006
Rh-105	1.7698e-005	6.5482e+005	2.6520e-005	9.8124e-001
Rh-106	1.2072e+001	4.4667e+011	1.8090e+001	6.6933e+005
Ru-103	1.8892e+001	6.9902e+011	2.8310e+001	1.0475e+006
Ru-105				
Ru-106	1.2072e+001	4.4667e+011	1.8090e+001	6.6933e+005
Sb-127	1.5796e-001	5.8445e+009	2.3670e-001	8.7579e+003
Sb-129				
Sr-89	1.0150e+002	3.7556e+012	1.5210e+002	5.6277e+006
Sr-90	1.9493e+001	7.2124e+011	2.9210e+001	1.0808e+006
Sr-91				
Sr-92				
Tc-99m	2.0067e-002	7.4247e+008	3.0070e-002	1.1126e+003
Te-127	5.3347e+000	1.9738e+011	7.9940e+000	2.9578e+005
Te-127m	5.0811e+000	1.8800e+011	7.6140e+000	2.8172e+005
Te-129	1.1618e+001	4.2988e+011	1.7410e+001	6.4417e+005
Te-129m	1.3434e+001	4.9704e+011	2.0130e+001	7.4481e+005
Te-131m	4.7735e-006	1.7662e+005	7.1530e-006	2.6466e-001
Te-132	9.7098e-001	3.5926e+010	1.4550e+000	5.3835e+004
Y-90	1.9593e+001	7.2494e+011	2.9360e+001	1.0863e+006
Y-91	1.7578e+000	6.5038e+010	2.6340e+000	9.7458e+004
Y-92				
Y-93				
Zr-95	2.0667e+000	7.6470e+010	3.0970e+000	1.1459e+005
Zr-97	4.2363e-013	1.5674e-002	6.3480e-013	2.3488e-008

Buildup
The material reference is : Shield 1

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	8.010e+07	0.000e+00	1.413e-27	0.000e+00	1.212e-28
0.02	5.979e+10	0.000e+00	1.660e-24	0.000e+00	5.750e-26
0.03	1.883e+12	6.081e-143	1.156e-22	6.026e-145	1.145e-24
0.04	2.716e+11	9.661e-70	4.422e-23	4.273e-72	1.956e-25
0.05	7.321e+09	9.570e-45	3.896e-24	2.549e-47	1.038e-26

DOS File: 10CS720.MS5
Run Date: August 30, 2005
Run Time: 1:24:43 PM
Duration: 00:00:32

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.299e+11	1.333e-31	4.964e-22	2.648e-34	9.859e-25
0.08	2.433e+11	1.922e-21	1.973e-19	3.042e-24	3.123e-22
0.1	1.453e+10	1.073e-18	2.798e-16	1.641e-21	4.281e-19
0.15	3.801e+11	2.750e-13	1.486e-10	4.529e-16	2.447e-13
0.2	2.072e+11	1.150e-11	7.089e-09	2.029e-14	1.251e-11
0.3	1.700e+12	1.576e-08	6.675e-06	2.989e-11	1.266e-08
0.4	5.618e+12	1.432e-06	3.740e-04	2.790e-09	7.288e-07
0.5	2.683e+12	7.894e-06	1.355e-03	1.550e-08	2.659e-06
0.6	2.951e+13	5.908e-04	7.084e-02	1.153e-06	1.383e-04
0.8	1.671e+13	6.037e-03	4.121e-01	1.148e-05	7.838e-04
1.0	1.758e+12	5.331e-03	2.375e-01	9.826e-06	4.379e-04
1.5	2.825e+12	3.005e-01	6.610e+00	5.056e-04	1.112e-02
2.0	2.377e+10	2.299e-02	3.326e-01	3.555e-05	5.144e-04
3.0	8.738e+10	1.179e+00	1.020e+01	1.600e-03	1.384e-02
TOTALS:	6.411e+13	1.515e+00	1.786e+01	2.164e-03	2.684e-02

For Information Only

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.	PROJECT	Calc. No. EC-RADN-1129
Date 08/31/2005	DBA-LOCA Total Control Room Dose	
Designed By T.F. Mackay		Sh. No. 340
Checked By M.M. Waselus		

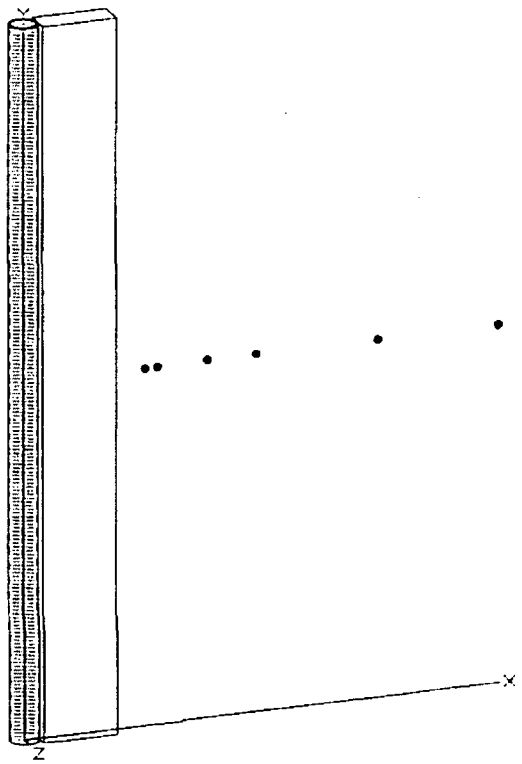
ATTACHMENT 8
MICROSHIELD COMPUTER CODE OUTPUT
14"GBB-101 SHINE TO CONTROL STRUCTURE
DOSE RATE vs DISTANCE FROM CRHE WALL

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

Page : 1
DOS File: ASTCS166.MS5
Date: August 10, 2005
Time: 4:53:17 PM
Duration: 00:02:37

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

Case Title: Control Room
Description: 14 inch core spray - Time = 0.1667 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241				
Ba-137m	5.9360e+001	2.1963e+012	7.2974e+001	2.7001e+006
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	8.3378e+001	3.0850e+012	1.0250e+002	3.7925e+006
Cs-136	2.6608e+001	9.8448e+011	3.2710e+001	1.2103e+006
Cs-137	6.2749e+001	2.3217e+012	7.7140e+001	2.8542e+006

DOS File: ASTCS166.MS5
Run Date: August 10, 2005
Run Time: 4:53:17 PM
Duration: 00:02:37

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	3.8736e+002	1.4332e+013	4.7620e+002	1.7619e+007
I-132	5.4777e+002	2.0267e+013	6.7340e+002	2.4916e+007
I-133	8.0140e+002	2.9652e+013	9.8520e+002	3.6452e+007
I-134	7.7944e+002	2.8839e+013	9.5820e+002	3.5453e+007
I-135	7.5170e+002	2.7813e+013	9.2410e+002	3.4192e+007
La-140				
La-141				
La-142				
Mo-99				
Nb-95				
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	7.8668e-001	2.9107e+010	9.6710e-001	3.5783e+004
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

DOS File: ASTCS166.MS5
Run Date: August 10, 2005
Run Time: 4:53:17 PM
Duration: 00:02:37

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.750e+12	3.181e-131	1.269e-21	3.153e-133	1.258e-23
0.04	6.766e+10	4.962e-64	1.301e-22	2.195e-66	5.754e-25
0.06	1.227e+11	4.573e-28	5.536e-21	9.082e-31	1.100e-23
0.08	4.371e+11	2.554e-18	2.440e-16	4.041e-21	3.862e-19
0.1	4.024e+09	1.166e-16	2.592e-14	1.784e-19	3.966e-17
0.15	1.560e+12	2.290e-10	9.996e-08	3.771e-13	1.646e-10
0.2	1.600e+12	1.283e-08	6.256e-06	2.265e-11	1.104e-08
0.3	3.401e+12	2.987e-06	1.009e-03	5.667e-09	1.914e-06
0.4	1.734e+13	3.169e-04	6.725e-02	6.176e-07	1.310e-04
0.5	3.712e+13	6.374e-03	9.034e-01	1.251e-05	1.773e-03
0.6	4.301e+13	4.280e-02	4.297e+00	8.355e-05	8.388e-03
0.8	7.855e+13	1.110e+00	6.473e+01	2.110e-03	1.231e-01
1.0	3.036e+13	3.022e+00	1.169e+02	5.571e-03	2.155e-01
1.5	2.289e+13	6.010e+01	1.175e+03	1.011e-01	1.976e+00
2.0	6.038e+12	1.214e+02	1.582e+03	1.878e-01	2.446e+00
TOTALS:	2.442e+14	1.857e+02	2.943e+03	2.967e-01	4.771e+00

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
[redacted]3	1.750e+12	2.847e-131	1.126e-21	2.821e-133	1.116e-23
0.04	6.766e+10	4.559e-64	1.154e-22	2.016e-66	5.105e-25
0.06	1.227e+11	4.158e-28	4.912e-21	8.258e-31	9.756e-24
0.08	4.371e+11	2.326e-18	2.223e-16	3.680e-21	3.517e-19
0.1	4.024e+09	1.063e-16	2.364e-14	1.626e-19	3.617e-17
0.15	1.560e+12	2.090e-10	9.121e-08	3.441e-13	1.502e-10
0.2	1.600e+12	1.171e-08	5.708e-06	2.067e-11	1.007e-08
0.3	3.401e+12	2.726e-06	9.204e-04	5.170e-09	1.746e-06
0.4	1.734e+13	2.891e-04	6.132e-02	5.633e-07	1.195e-04
0.5	3.712e+13	5.812e-03	8.235e-01	1.141e-05	1.616e-03
0.6	4.301e+13	3.902e-02	3.917e+00	7.617e-05	7.645e-03
0.8	7.855e+13	1.011e+00	5.898e+01	1.923e-03	1.122e-01
1.0	3.036e+13	2.754e+00	1.065e+02	5.076e-03	1.963e-01
1.5	2.289e+13	5.473e+01	1.070e+03	9.209e-02	1.799e+00
2.0	6.038e+12	1.106e+02	1.440e+03	1.710e-01	2.227e+00
TOTALS:	2.442e+14	1.691e+02	2.680e+03	2.702e-01	4.344e+00

Results - Dose Point # 3 - (228.6,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.750e+12	2.105e-131	7.493e-22	2.086e-133	7.426e-24
0.04	6.766e+10	3.347e-64	7.681e-23	1.480e-66	3.397e-25
[redacted]06	1.227e+11	3.036e-28	3.268e-21	6.029e-31	6.492e-24
[redacted]8	4.371e+11	1.706e-18	1.631e-16	2.700e-21	2.581e-19
0.1	4.024e+09	7.815e-17	1.738e-14	1.196e-19	2.659e-17
0.15	1.560e+12	1.539e-10	6.715e-08	2.534e-13	1.106e-10

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.2	1.600e+12	8.625e-09	4.203e-06	1.522e-11	7.419e-09
0.3	3.401e+12	2.007e-06	6.776e-04	3.807e-09	1.285e-06
0.4	1.734e+13	2.128e-04	4.513e-02	4.147e-07	8.794e-05
0.5	3.712e+13	4.278e-03	6.059e-01	8.397e-06	1.189e-03
0.6	4.301e+13	2.871e-02	2.881e+00	5.605e-05	5.624e-03
0.8	7.855e+13	7.438e-01	4.337e+01	1.415e-03	8.250e-02
1.0	3.036e+13	2.025e+00	7.827e+01	3.732e-03	1.443e-01
1.5	2.289e+13	4.023e+01	7.858e+02	6.768e-02	1.322e+00
2.0	6.038e+12	8.123e+01	1.058e+03	1.256e-01	1.636e+00
TOTALS:	2.442e+14	1.243e+02	1.969e+03	1.985e-01	3.192e+00

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.750e+12	1.649e-131	5.375e-22	1.634e-133	5.327e-24
0.04	6.766e+10	2.600e-64	5.509e-23	1.150e-66	2.437e-25
0.06	1.227e+11	2.377e-28	2.344e-21	4.721e-31	4.656e-24
0.08	4.371e+11	1.338e-18	1.279e-16	2.118e-21	2.025e-19
0.1	4.024e+09	6.136e-17	1.365e-14	9.388e-20	2.088e-17
0.15	1.560e+12	1.210e-10	5.282e-08	1.992e-13	8.698e-11
0.2	1.600e+12	6.787e-09	3.309e-06	1.198e-11	5.839e-09
0.3	3.401e+12	1.580e-06	5.337e-04	2.998e-09	1.012e-06
0.4	1.734e+13	1.676e-04	3.556e-02	3.266e-07	6.928e-05
0.5	3.712e+13	3.370e-03	4.775e-01	6.615e-06	9.372e-04
0.6	4.301e+13	2.263e-02	2.271e+00	4.416e-05	4.432e-03
0.8	7.855e+13	5.862e-01	3.419e+01	1.115e-03	6.503e-02
1.0	3.036e+13	1.596e+00	6.171e+01	2.942e-03	1.137e-01
1.5	2.289e+13	3.172e+01	6.197e+02	5.336e-02	1.043e+00
2.0	6.038e+12	6.406e+01	8.343e+02	9.906e-02	1.290e+00
TOTALS:	2.442e+14	9.798e+01	1.553e+03	1.565e-01	2.517e+00

Results - Dose Point # 5 - (441.96,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.750e+12	1.016e-131	2.807e-22	1.007e-133	2.782e-24
0.04	6.766e+10	1.638e-64	2.877e-23	7.246e-67	1.273e-25
0.06	1.227e+11	1.513e-28	1.224e-21	3.005e-31	2.432e-24
0.08	4.371e+11	8.551e-19	8.179e-17	1.353e-21	1.294e-19
0.1	4.024e+09	3.930e-17	8.752e-15	6.013e-20	1.339e-17
0.15	1.560e+12	7.774e-11	3.399e-08	1.280e-13	5.597e-11
0.2	1.600e+12	4.369e-09	2.133e-06	7.711e-12	3.765e-09
0.3	3.401e+12	1.020e-06	3.449e-04	1.935e-09	6.542e-07
0.4	1.734e+13	1.084e-04	2.301e-02	2.111e-07	4.484e-05
0.5	3.712e+13	2.181e-03	3.093e-01	4.281e-06	6.072e-04
0.6	4.301e+13	1.466e-02	1.472e+00	2.861e-05	2.874e-03
0.8	7.855e+13	3.802e-01	2.219e+01	7.232e-04	4.221e-02

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
1.0	3.036e+13	1.036e+00	4.009e+01	1.910e-03	7.390e-02
1.5	2.289e+13	2.061e+01	4.029e+02	3.468e-02	6.778e-01
2.0	6.038e+12	4.164e+01	5.423e+02	6.440e-02	8.386e-01
TOTALS:	2.442e+14	6.369e+01	1.009e+03	1.017e-01	1.636e+00

Results - Dose Point # 6 - (594.36,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.750e+12	7.125e-132	1.706e-22	7.061e-134	1.690e-24
0.04	6.766e+10	1.169e-64	1.748e-23	5.168e-67	7.732e-26
0.06	1.227e+11	1.090e-28	7.439e-22	2.164e-31	1.478e-24
0.08	4.371e+11	6.180e-19	5.913e-17	9.779e-22	9.358e-20
0.1	4.024e+09	2.846e-17	6.345e-15	4.354e-20	9.707e-18
0.15	1.560e+12	5.647e-11	2.473e-08	9.300e-14	4.072e-11
0.2	1.600e+12	3.180e-09	1.555e-06	5.613e-12	2.745e-09
0.3	3.401e+12	7.444e-07	2.521e-04	1.412e-09	4.782e-07
0.4	1.734e+13	7.922e-05	1.685e-02	1.544e-07	3.282e-05
0.5	3.712e+13	1.596e-03	2.266e-01	3.133e-06	4.449e-04
0.6	4.301e+13	1.073e-02	1.079e+00	2.095e-05	2.106e-03
[illegible]	7.855e+13	2.787e-01	1.627e+01	5.300e-04	3.094e-02
[illegible]	3.036e+13	7.594e-01	2.937e+01	1.400e-03	5.413e-02
1.5	2.289e+13	1.508e+01	2.941e+02	2.537e-02	4.949e-01
2.0	6.038e+12	3.036e+01	3.942e+02	4.695e-02	6.095e-01
TOTALS:	2.442e+14	4.649e+01	7.353e+02	7.427e-02	1.192e+00

For Information Only

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

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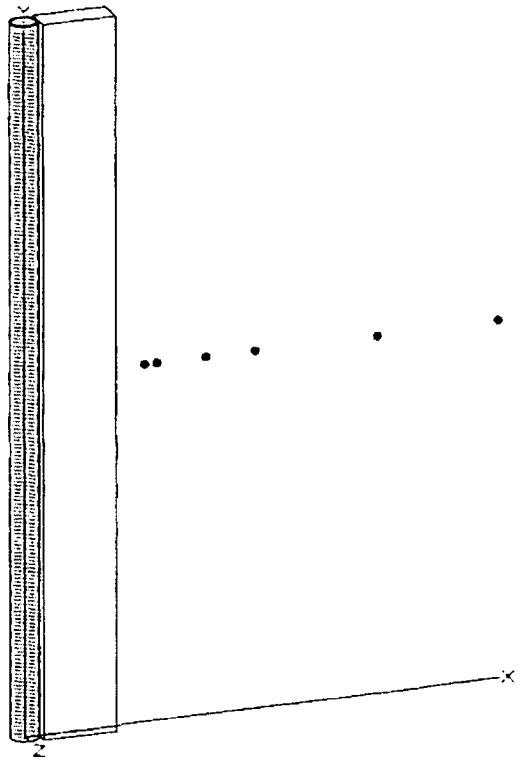
File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 14 inch core spray - Time = 0.5 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241				
Ba-137m	1.7799e+002	6.5856e+012	2.1881e+002	8.0960e+006
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	2.4997e+002	9.2489e+012	3.0730e+002	1.1370e+007
Cs-136	7.9733e+001	2.9501e+012	9.8020e+001	3.6267e+006
Cs-137	1.8815e+002	6.9615e+012	2.3130e+002	8.5581e+006

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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	1.1600e+003	4.2919e+013	1.4260e+003	5.2762e+007
I-132	1.5618e+003	5.7787e+013	1.9200e+003	7.1040e+007
I-133	2.3769e+003	8.7944e+013	2.9220e+003	1.0811e+008
I-134	1.7961e+003	6.6455e+013	2.2080e+003	8.1696e+007
I-135	2.1768e+003	8.0540e+013	2.6760e+003	9.9012e+007
La-140				
La-141				
La-142				
Mo-99				
Nb-95				
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	2.3573e+000	8.7222e+010	2.8980e+000	1.0723e+005
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	4.912e+12	8.926e-131	3.561e-21	8.846e-133	3.530e-23
0.04	2.028e+11	1.487e-63	3.900e-22	6.578e-66	1.725e-24
0.06	3.677e+11	1.370e-27	1.659e-20	2.722e-30	3.295e-23
0.08	1.309e+12	7.647e-18	7.309e-16	1.210e-20	1.157e-18
0.1	1.206e+10	3.494e-16	7.768e-14	5.345e-19	1.188e-16
0.15	3.708e+12	5.442e-10	2.376e-07	8.962e-13	3.912e-10
0.2	4.150e+12	3.328e-08	1.623e-05	5.874e-11	2.864e-08
0.3	9.883e+12	8.680e-06	2.932e-03	1.646e-08	5.562e-06
0.4	4.920e+13	8.992e-04	1.908e-01	1.752e-06	3.718e-04
0.5	1.069e+14	1.835e-02	2.601e+00	3.602e-05	5.105e-03
0.6	1.183e+14	1.178e-01	1.182e+01	2.299e-04	2.308e-02
0.8	1.972e+14	2.785e+00	1.625e+02	5.297e-03	3.091e-01
1.0	8.122e+13	8.086e+00	3.127e+02	1.490e-02	5.765e-01
1.5	6.391e+13	1.678e+02	3.280e+03	2.823e-01	5.518e+00
2.0	1.609e+13	3.236e+02	4.215e+03	5.004e-01	6.518e+00
TOTALS:	6.573e+14	5.024e+02	7.985e+03	8.032e-01	1.295e+01

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	4.912e+12	7.987e-131	3.160e-21	7.916e-133	3.132e-23
0.04	2.028e+11	1.367e-63	3.460e-22	6.044e-66	1.530e-24
0.06	3.677e+11	1.246e-27	1.472e-20	2.475e-30	2.923e-23
0.08	1.309e+12	6.965e-18	6.656e-16	1.102e-20	1.053e-18
0.1	1.206e+10	3.186e-16	7.084e-14	4.874e-19	1.084e-16
0.15	3.708e+12	4.966e-10	2.168e-07	8.178e-13	3.570e-10
0.2	4.150e+12	3.038e-08	1.481e-05	5.361e-11	2.613e-08
0.3	9.883e+12	7.919e-06	2.674e-03	1.502e-08	5.073e-06
0.4	4.920e+13	8.202e-04	1.740e-01	1.598e-06	3.390e-04
0.5	1.069e+14	1.673e-02	2.371e+00	3.285e-05	4.654e-03
0.6	1.183e+14	1.074e-01	1.078e+01	2.096e-04	2.103e-02
0.8	1.972e+14	2.538e+00	1.481e+02	4.828e-03	2.816e-01
1.0	8.122e+13	7.367e+00	2.849e+02	1.358e-02	5.251e-01
1.5	6.391e+13	1.528e+02	2.986e+03	2.571e-01	5.025e+00
2.0	1.609e+13	2.946e+02	3.837e+03	4.556e-01	5.934e+00
TOTALS:	6.573e+14	4.575e+02	7.270e+03	7.314e-01	1.179e+01

Results - Dose Point # 3 - (228.6,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	4.912e+12	5.905e-131	2.103e-21	5.853e-133	2.084e-23
0.04	2.028e+11	1.003e-63	2.302e-22	4.437e-66	1.018e-24
0.06	3.677e+11	9.097e-28	9.794e-21	1.807e-30	1.945e-23
0.08	1.309e+12	5.110e-18	4.885e-16	8.086e-21	7.730e-19
0.1	1.206e+10	2.342e-16	5.208e-14	3.583e-19	7.968e-17
0.15	3.708e+12	3.657e-10	1.596e-07	6.022e-13	2.628e-10

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.2	4.150e+12	2.237e-08	1.090e-05	3.948e-11	1.924e-08
0.3	9.883e+12	5.832e-06	1.969e-03	1.106e-08	3.735e-06
0.4	4.920e+13	6.038e-04	1.280e-01	1.176e-06	2.495e-04
0.5	1.069e+14	1.232e-02	1.745e+00	2.418e-05	3.424e-03
0.6	1.183e+14	7.900e-02	7.927e+00	1.542e-04	1.547e-02
0.8	1.972e+14	1.867e+00	1.089e+02	3.551e-03	2.071e-01
1.0	8.122e+13	5.417e+00	2.094e+02	9.986e-03	3.860e-01
1.5	6.391e+13	1.123e+02	2.194e+03	1.890e-01	3.692e+00
2.0	1.609e+13	2.164e+02	2.819e+03	3.347e-01	4.359e+00
TOTALS:	6.573e+14	3.361e+02	5.341e+03	5.374e-01	8.663e+00

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	4.912e+12	4.627e-131	1.508e-21	4.586e-133	1.495e-23
0.04	2.028e+11	7.794e-64	1.651e-22	3.447e-66	7.304e-25
0.06	3.677e+11	7.123e-28	7.025e-21	1.415e-30	1.395e-23
0.08	1.309e+12	4.008e-18	3.832e-16	6.342e-21	6.063e-19
0.1	1.206e+10	1.839e-16	4.091e-14	2.813e-19	6.258e-17
0.15	3.708e+12	2.875e-10	1.255e-07	4.735e-13	2.067e-10
0.2	4.150e+12	1.760e-08	8.582e-06	3.107e-11	1.515e-08
0.3	9.883e+12	4.592e-06	1.551e-03	8.710e-09	2.941e-06
0.4	4.920e+13	4.756e-04	1.009e-01	9.266e-07	1.966e-04
0.5	1.069e+14	9.703e-03	1.375e+00	1.905e-05	2.698e-03
0.6	1.183e+14	6.225e-02	6.247e+00	1.215e-04	1.219e-02
0.8	1.972e+14	1.471e+00	8.582e+01	2.799e-03	1.632e-01
1.0	8.122e+13	4.270e+00	1.651e+02	7.872e-03	3.043e-01
1.5	6.391e+13	8.856e+01	1.730e+03	1.490e-01	2.911e+00
2.0	1.609e+13	1.707e+02	2.223e+03	2.639e-01	3.437e+00
TOTALS:	6.573e+14	2.651e+02	4.212e+03	4.238e-01	6.831e+00

Results - Dose Point # 5 - (441.96,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	4.912e+12	2.852e-131	7.876e-22	2.826e-133	7.806e-24
0.04	2.028e+11	4.911e-64	8.625e-23	2.172e-66	3.814e-25
0.06	3.677e+11	4.533e-28	3.669e-21	9.005e-31	7.287e-24
0.08	1.309e+12	2.561e-18	2.449e-16	4.053e-21	3.876e-19
0.1	1.206e+10	1.178e-16	2.623e-14	1.802e-19	4.012e-17
0.15	3.708e+12	1.848e-10	8.077e-08	3.043e-13	1.330e-10
0.2	4.150e+12	1.133e-08	5.533e-06	2.000e-11	9.766e-09
0.3	9.883e+12	2.963e-06	1.002e-03	5.621e-09	1.901e-06
0.4	4.920e+13	3.074e-04	6.529e-02	5.990e-07	1.272e-04
0.5	1.069e+14	6.280e-03	8.907e-01	1.233e-05	1.748e-03
0.6	1.183e+14	4.032e-02	4.051e+00	7.870e-05	7.907e-03
0.8	1.972e+14	9.544e-01	5.571e+01	1.815e-03	1.060e-01

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Duration: 00:02:35

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
1.0	8.122e+13	2.772e+00	1.073e+02	5.110e-03	1.977e-01
1.5	6.391e+13	5.756e+01	1.125e+03	9.684e-02	1.893e+00
2.0	1.609e+13	1.110e+02	1.445e+03	1.716e-01	2.234e+00
TOTALS:	6.573e+14	1.723e+02	2.738e+03	2.754e-01	4.441e+00

Results - Dose Point # 6 - (594.36,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	4.912e+12	1.999e-131	4.786e-22	1.981e-133	4.743e-24
0.04	2.028e+11	3.503e-64	5.240e-23	1.549e-66	2.318e-25
0.06	3.677e+11	3.265e-28	2.229e-21	6.485e-31	4.428e-24
0.08	1.309e+12	1.851e-18	1.771e-16	2.929e-21	2.803e-19
0.1	1.206e+10	8.528e-17	1.901e-14	1.305e-19	2.909e-17
0.15	3.708e+12	1.342e-10	5.877e-08	2.210e-13	9.677e-11
0.2	4.150e+12	8.249e-09	4.034e-06	1.456e-11	7.120e-09
0.3	9.883e+12	2.163e-06	7.325e-04	4.103e-09	1.389e-06
0.4	4.920e+13	2.248e-04	4.779e-02	4.379e-07	9.312e-05
0.5	1.069e+14	4.596e-03	6.525e-01	9.022e-06	1.281e-03
0.6	1.183e+14	2.953e-02	2.969e+00	5.765e-05	5.795e-03
0.8	1.972e+14	6.995e-01	4.084e+01	1.330e-03	7.767e-02
1.0	8.122e+13	2.032e+00	7.857e+01	3.745e-03	1.448e-01
1.5	6.391e+13	4.210e+01	8.213e+02	7.083e-02	1.382e+00
2.0	1.609e+13	8.089e+01	1.050e+03	1.251e-01	1.624e+00
TOTALS:	6.573e+14	1.258e+02	1.995e+03	2.011e-01	3.236e+00

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

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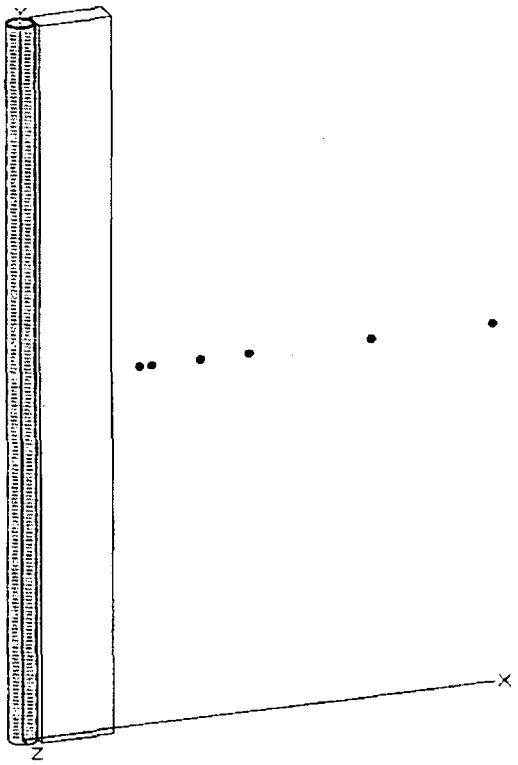
Duration: 00:03:24

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

Case Title: Control Room
Description: 14 inch core spray - Time = 1 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	3.6849e-004	1.3634e+007	4.5300e-004	1.6761e+001
Ba-137m	4.1523e+002	1.5363e+013	5.1046e+002	1.8887e+007
Ba-139	1.7115e+002	6.3325e+012	2.1040e+002	7.7848e+006
Ba-140	2.8357e+002	1.0492e+013	3.4860e+002	1.2898e+007
Ce-141	6.5189e+000	2.4120e+011	8.0140e+000	2.9652e+005
Ce-143	5.9267e+000	2.1929e+011	7.2860e+000	2.6958e+005
Ce-144	5.4818e+000	2.0283e+011	6.7390e+000	2.4934e+005
Cm-242	9.6474e-002	3.5695e+009	1.1860e-001	4.3882e+003
Cm-244	5.6550e-003	2.0924e+008	6.9520e-003	2.5722e+002
Co-58	1.0737e-001	3.9728e+009	1.3200e-001	4.8840e+003
Co-60	5.7819e-002	2.1393e+009	7.1080e-002	2.6300e+003
Cs-134	5.8315e+002	2.1577e+013	7.1690e+002	2.6525e+007
Cs-136	1.8579e+002	6.8742e+012	2.2840e+002	8.4508e+006
Cs-137	4.3893e+002	1.6240e+013	5.3960e+002	1.9965e+007

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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	3.0886e+003	1.1428e+014	3.7970e+003	1.4049e+008
I-132	3.9875e+003	1.4754e+014	4.9020e+003	1.8137e+008
I-133	6.2318e+003	2.3058e+014	7.6610e+003	2.8346e+008
I-134	3.2245e+003	1.1931e+014	3.9640e+003	1.4667e+008
I-135	5.5070e+003	2.0376e+014	6.7700e+003	2.5049e+008
La-140	4.4731e+000	1.6550e+011	5.4990e+000	2.0346e+005
La-141	2.1621e+000	7.9999e+010	2.6580e+000	9.8346e+004
La-142	1.6106e+000	5.9593e+010	1.9800e+000	7.3260e+004
Mo-99	3.6239e+001	1.3408e+012	4.4550e+001	1.6483e+006
Nb-95	2.7836e+000	1.0299e+011	3.4220e+000	1.2661e+005
Nd-147	1.0502e+000	3.8856e+010	1.2910e+000	4.7767e+004
Np-239	7.5967e+001	2.8108e+012	9.3390e+001	3.4554e+006
Pr-143	2.3354e+000	8.6409e+010	2.8710e+000	1.0623e+005
Pr-144	5.4034e+000	1.9993e+011	6.6426e+000	2.4578e+005
Pu-238	1.6521e-002	6.1128e+008	2.0310e-002	7.5147e+002
Pu-239	1.7546e-003	6.4920e+007	2.1570e-003	7.9809e+001
Pu-240	2.8218e-003	1.0441e+008	3.4690e-003	1.2835e+002
Pu-241	6.9590e-001	2.5748e+010	8.5550e-001	3.1653e+004
Rb-86	5.4956e+000	2.0334e+011	6.7560e+000	2.4997e+005
Rh-103m	3.1105e+001	1.1509e+012	3.8239e+001	1.4148e+006
Rh-105	2.0100e+001	7.4370e+011	2.4710e+001	9.1427e+005
Rh-106	1.2429e+001	4.5989e+011	1.5280e+001	5.6536e+005
Ru-103	3.1187e+001	1.1539e+012	3.8340e+001	1.4186e+006
Ru-105	1.8449e+001	6.8261e+011	2.2680e+001	8.3916e+005
Ru-106	1.2429e+001	4.5989e+011	1.5280e+001	5.6536e+005
Sb-127	3.3807e+001	1.2508e+012	4.1560e+001	1.5377e+006
Sb-129	1.0721e+002	3.9668e+012	1.3180e+002	4.8766e+006
Sr-89	1.4902e+002	5.5138e+012	1.8320e+002	6.7784e+006
Sr-90	1.9002e+001	7.0307e+011	2.3360e+001	8.6432e+005
Sr-91	1.7668e+002	6.5371e+012	2.1720e+002	8.0364e+006
Sr-92	1.5626e+002	5.7817e+012	1.9210e+002	7.1077e+006
Tc-99m	3.2432e+001	1.2000e+012	3.9870e+001	1.4752e+006
Te-127	3.3758e+001	1.2490e+012	4.1500e+001	1.5355e+006
Te-127m	5.7600e+000	2.1312e+011	7.0810e+000	2.6200e+005
Te-129	1.1404e+002	4.2196e+012	1.4020e+002	5.1874e+006
Te-129m	2.4127e+001	8.9268e+011	2.9660e+001	1.0974e+006
Te-131m	7.6146e+001	2.8174e+012	9.3610e+001	3.4636e+006
Te-132	5.5355e+002	2.0481e+013	6.8050e+002	2.5179e+007
Y-90	2.5802e-001	9.5469e+009	3.1720e-001	1.1736e+004
Y-91	1.9523e+000	7.2233e+010	2.4000e+000	8.8800e+004
Y-92	1.1258e+001	4.1655e+011	1.3840e+001	5.1208e+005
Y-93	1.4471e+000	5.3543e+010	1.7790e+000	6.5823e+004
Zr-95	2.7820e+000	1.0293e+011	3.4200e+000	1.2654e+005
Zr-97	2.6437e+000	9.7816e+010	3.2500e+000	1.2025e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

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Run Date: August 10, 2005
Run Time: 4:46:26 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.340e+08	0.000e+00	2.792e-26	0.000e+00	2.395e-27
0.02	2.353e+11	0.000e+00	7.716e-23	0.000e+00	2.673e-24
0.03	2.852e+13	5.183e-130	2.068e-20	5.137e-132	2.050e-22
0.04	7.776e+11	5.703e-63	1.495e-21	2.522e-65	6.613e-24
0.05	2.693e+12	8.948e-38	1.693e-20	2.384e-40	4.509e-23
0.06	9.326e+11	3.476e-27	4.208e-20	6.903e-30	8.357e-23
0.08	3.552e+12	2.075e-17	1.983e-15	3.284e-20	3.138e-18
0.1	3.096e+12	8.969e-14	1.994e-11	1.372e-16	3.051e-14
0.15	1.025e+13	1.505e-09	6.568e-07	2.478e-12	1.082e-09
0.2	2.835e+13	2.274e-07	1.108e-04	4.013e-10	1.956e-07
0.3	2.701e+13	2.373e-05	8.015e-03	4.501e-08	1.520e-05
0.4	1.243e+14	2.271e-03	4.819e-01	4.425e-06	9.389e-04
0.5	2.772e+14	4.760e-02	6.746e+00	9.343e-05	1.324e-02
0.6	2.844e+14	2.830e-01	2.841e+01	5.524e-04	5.546e-02
0.8	4.203e+14	5.937e+00	3.464e+02	1.129e-02	6.588e-01
1.0	1.923e+14	1.914e+01	7.405e+02	3.529e-02	1.365e+00
1.5	1.617e+14	4.247e+02	8.300e+03	7.146e-01	1.397e+01
2.0	3.704e+13	7.450e+02	9.706e+03	1.152e+00	1.501e+01
3.0	2.222e+10	5.133e+00	4.072e+01	6.964e-03	5.524e-02
4.0	1.564e+09	1.525e+00	8.930e+00	1.887e-03	1.105e-02
TOTALS:	1.603e+15	1.202e+03	1.918e+04	1.923e+00	3.113e+01

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.340e+08	0.000e+00	2.477e-26	0.000e+00	2.125e-27
0.02	2.353e+11	0.000e+00	6.845e-23	0.000e+00	2.371e-24
0.03	2.852e+13	4.638e-130	1.835e-20	4.597e-132	1.819e-22
0.04	7.776e+11	5.240e-63	1.327e-21	2.318e-65	5.867e-24
0.05	2.693e+12	8.155e-38	1.502e-20	2.172e-40	4.000e-23
0.06	9.326e+11	3.160e-27	3.733e-20	6.277e-30	7.415e-23
0.08	3.552e+12	1.890e-17	1.806e-15	2.990e-20	2.858e-18
0.1	3.096e+12	8.178e-14	1.818e-11	1.251e-16	2.782e-14
0.15	1.025e+13	1.373e-09	5.993e-07	2.261e-12	9.869e-10
0.2	2.835e+13	2.075e-07	1.011e-04	3.662e-10	1.785e-07
0.3	2.701e+13	2.165e-05	7.310e-03	4.106e-08	1.387e-05
0.4	1.243e+14	2.071e-03	4.394e-01	4.036e-06	8.561e-04
0.5	2.772e+14	4.340e-02	6.149e+00	8.519e-05	1.207e-02
0.6	2.844e+14	2.580e-01	2.590e+01	5.036e-04	5.055e-02
0.8	4.203e+14	5.410e+00	3.156e+02	1.029e-02	6.003e-01
1.0	1.923e+14	1.744e+01	6.745e+02	3.215e-02	1.243e+00
1.5	1.617e+14	3.868e+02	7.558e+03	6.508e-01	1.272e+01
2.0	3.704e+13	6.784e+02	8.836e+03	1.049e+00	1.366e+01
3.0	2.222e+10	4.672e+00	3.706e+01	6.339e-03	5.028e-02
4.0	1.564e+09	1.388e+00	8.125e+00	1.717e-03	1.005e-02
TOTALS:	1.603e+15	1.094e+03	1.746e+04	1.751e+00	2.835e+01

Results - Dose Point # 3 - (228.6,457.2,0) cm

DOS File: ASTCS1.MS5
Run Date: August 10, 2005
Run Time: 4:46:26 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.340e+08	0.000e+00	1.648e-26	0.000e+00	1.414e-27
0.02	2.353e+11	0.000e+00	4.555e-23	0.000e+00	1.578e-24
0.03	2.852e+13	3.429e-130	1.221e-20	3.399e-132	1.210e-22
0.04	7.776e+11	3.846e-63	8.828e-22	1.701e-65	3.904e-24
0.05	2.693e+12	5.931e-38	9.993e-21	1.580e-40	2.662e-23
0.06	9.326e+11	2.307e-27	2.484e-20	4.583e-30	4.934e-23
0.08	3.552e+12	1.387e-17	1.325e-15	2.194e-20	2.097e-18
0.1	3.096e+12	6.012e-14	1.337e-11	9.197e-17	2.045e-14
0.15	1.025e+13	1.011e-09	4.412e-07	1.665e-12	7.266e-10
0.2	2.835e+13	1.528e-07	7.447e-05	2.697e-10	1.314e-07
0.3	2.701e+13	1.594e-05	5.382e-03	3.024e-08	1.021e-05
0.4	1.243e+14	1.525e-03	3.234e-01	2.971e-06	6.301e-04
0.5	2.772e+14	3.194e-02	4.525e+00	6.270e-05	8.881e-03
0.6	2.844e+14	1.898e-01	1.905e+01	3.706e-04	3.718e-02
0.8	4.203e+14	3.980e+00	2.321e+02	7.570e-03	4.414e-01
1.0	1.923e+14	1.283e+01	4.959e+02	2.364e-02	9.140e-01
1.5	1.617e+14	2.843e+02	5.553e+03	4.783e-01	9.344e+00
2.0	3.704e+13	4.984e+02	6.490e+03	7.707e-01	1.004e+01
3.0	2.222e+10	3.431e+00	2.721e+01	4.655e-03	3.692e-02
4.0	1.564e+09	1.019e+00	5.965e+00	1.261e-03	7.379e-03
TOTALS:	1.603e+15	8.041e+02	1.283e+04	1.287e+00	2.083e+01

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.340e+08	0.000e+00	1.182e-26	0.000e+00	1.014e-27
0.02	2.353e+11	0.000e+00	3.267e-23	0.000e+00	1.132e-24
0.03	2.852e+13	2.687e-130	8.758e-21	2.663e-132	8.680e-23
0.04	7.776e+11	2.988e-63	6.332e-22	1.322e-65	2.800e-24
0.05	2.693e+12	4.636e-38	7.168e-21	1.235e-40	1.909e-23
0.06	9.326e+11	1.807e-27	1.782e-20	3.588e-30	3.539e-23
0.08	3.552e+12	1.087e-17	1.040e-15	1.721e-20	1.645e-18
0.1	3.096e+12	4.721e-14	1.050e-11	7.222e-17	1.607e-14
0.15	1.025e+13	7.950e-10	3.471e-07	1.309e-12	5.716e-10
0.2	2.835e+13	1.202e-07	5.862e-05	2.122e-10	1.035e-07
0.3	2.701e+13	1.255e-05	4.239e-03	2.381e-08	8.040e-06
0.4	1.243e+14	1.201e-03	2.548e-01	2.340e-06	4.964e-04
0.5	2.772e+14	2.516e-02	3.565e+00	4.940e-05	6.998e-03
0.6	2.844e+14	1.496e-01	1.501e+01	2.920e-04	2.930e-02
0.8	4.203e+14	3.137e+00	1.829e+02	5.966e-03	3.479e-01
1.0	1.923e+14	1.011e+01	3.909e+02	1.864e-02	7.206e-01
1.5	1.617e+14	2.241e+02	4.379e+03	3.771e-01	7.368e+00
2.0	3.704e+13	3.930e+02	5.118e+03	6.078e-01	7.915e+00
3.0	2.222e+10	2.706e+00	2.146e+01	3.672e-03	2.912e-02
4.0	1.564e+09	8.037e-01	4.704e+00	9.942e-04	5.820e-03
TOTALS:	1.603e+15	6.341e+02	1.012e+04	1.014e+00	1.642e+01

Results - Dose Point # 5 - (441.96,457.2,0) cm

DOS File: ASTCS1.MS5
Run Date: August 10, 2005
Run Time: 4:46:26 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.340e+08	0.000e+00	6.174e-27	0.000e+00	5.296e-28
0.02	2.353e+11	0.000e+00	1.706e-23	0.000e+00	5.911e-25
0.03	2.852e+13	1.656e-130	4.574e-21	1.641e-132	4.533e-23
0.04	7.776e+11	1.883e-63	3.307e-22	8.328e-66	1.463e-24
0.05	2.693e+12	2.940e-38	3.743e-21	7.833e-41	9.972e-24
0.06	9.326e+11	1.150e-27	9.306e-21	2.284e-30	1.848e-23
0.08	3.552e+12	6.949e-18	6.646e-16	1.100e-20	1.052e-18
0.1	3.096e+12	3.023e-14	6.732e-12	4.625e-17	1.030e-14
0.15	1.025e+13	5.108e-10	2.233e-07	8.412e-13	3.678e-10
0.2	2.835e+13	7.741e-08	3.779e-05	1.366e-10	6.671e-08
0.3	2.701e+13	8.101e-06	2.739e-03	1.537e-08	5.196e-06
0.4	1.243e+14	7.764e-04	1.649e-01	1.513e-06	3.213e-04
0.5	2.772e+14	1.629e-02	2.310e+00	3.197e-05	4.534e-03
0.6	2.844e+14	9.690e-02	9.735e+00	1.891e-04	1.900e-02
0.8	4.203e+14	2.034e+00	1.188e+02	3.870e-03	2.259e-01
1.0	1.923e+14	6.564e+00	2.540e+02	1.210e-02	4.681e-01
1.5	1.617e+14	1.457e+02	2.847e+03	2.451e-01	4.790e+00
2.0	3.704e+13	2.555e+02	3.327e+03	3.951e-01	5.145e+00
3.0	2.222e+10	1.758e+00	1.392e+01	2.385e-03	1.889e-02
4.0	1.564e+09	5.211e-01	3.044e+00	6.447e-04	3.766e-03
TOTALS:	1.603e+15	4.122e+02	6.576e+03	6.594e-01	1.068e+01

Results - Dose Point # 6 - (594.36,457.2,0) cm

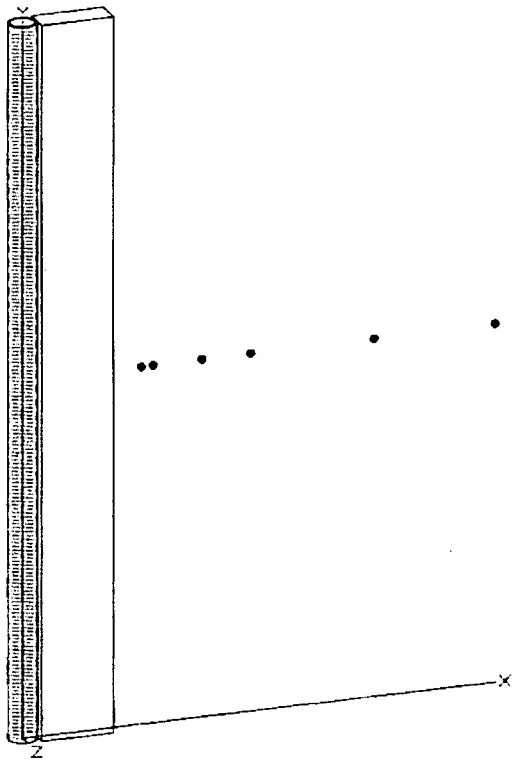
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.340e+08	0.000e+00	3.752e-27	0.000e+00	3.218e-28
0.02	2.353e+11	0.000e+00	1.037e-23	0.000e+00	3.591e-25
0.03	2.852e+13	1.161e-130	2.779e-21	1.151e-132	2.754e-23
0.04	7.776e+11	1.343e-63	2.009e-22	5.940e-66	8.886e-25
0.05	2.693e+12	2.111e-38	2.274e-21	5.623e-41	6.059e-24
0.06	9.326e+11	8.282e-28	5.654e-21	1.645e-30	1.123e-23
0.08	3.552e+12	5.022e-18	4.805e-16	7.947e-21	7.604e-19
0.1	3.096e+12	2.189e-14	4.881e-12	3.349e-17	7.467e-15
0.15	1.025e+13	3.711e-10	1.625e-07	6.111e-13	2.676e-10
0.2	2.835e+13	5.635e-08	2.756e-05	9.945e-11	4.864e-08
0.3	2.701e+13	5.912e-06	2.002e-03	1.122e-08	3.798e-06
0.4	1.243e+14	5.676e-04	1.207e-01	1.106e-06	2.352e-04
0.5	2.772e+14	1.192e-02	1.692e+00	2.340e-05	3.322e-03
0.6	2.844e+14	7.097e-02	7.135e+00	1.385e-04	1.393e-02
0.8	4.203e+14	1.491e+00	8.705e+01	2.836e-03	1.656e-01
1.0	1.923e+14	4.810e+00	1.860e+02	8.867e-03	3.429e-01
1.5	1.617e+14	1.065e+02	2.079e+03	1.793e-01	3.497e+00
2.0	3.704e+13	1.863e+02	2.418e+03	2.880e-01	3.740e+00
3.0	2.222e+10	1.272e+00	1.003e+01	1.726e-03	1.361e-02
4.0	1.564e+09	3.748e-01	2.177e+00	4.637e-04	2.693e-03
TOTALS:	1.603e+15	3.008e+02	4.791e+03	4.814e-01	7.779e+00

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

Page : 1
DOS File: ASTCS2.MS5
Date: August 10, 2005
Time: 4:55:54 PM
Duration: 00:03:24

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

Case Title: Control Room
Description: 14 inch core spray - Time = 2 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.1055e-003	4.0902e+007	1.3590e-003	5.0283e+001
Ba-137m	8.8956e+002	3.2914e+013	1.0936e+003	4.0462e+007
Ba-139	3.1041e+002	1.1485e+013	3.8160e+002	1.4119e+007
Ba-140	8.4842e+002	3.1391e+013	1.0430e+003	3.8591e+007
Ce-141	1.9539e+001	7.2294e+011	2.4020e+001	8.8874e+005
Ce-143	1.7399e+001	6.4378e+011	2.1390e+001	7.9143e+005
Ce-144	1.6431e+001	6.0796e+011	2.0200e+001	7.4740e+005
Cm-242	2.8918e-001	1.0700e+010	3.5550e-001	1.3153e+004
Cm-244	1.6952e-002	6.2723e+008	2.0840e-002	7.7108e+002
Co-58	3.2188e-001	1.1909e+010	3.9570e-001	1.4641e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2486e+003	4.6199e+013	1.5350e+003	5.6795e+007
Cs-136	3.9704e+002	1.4690e+013	4.8810e+002	1.8060e+007
Cs-137	9.4034e+002	3.4792e+013	1.1560e+003	4.2772e+007

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	6.9224e+003	2.5613e+014	8.5100e+003	3.1487e+008
I-132	8.0750e+003	2.9878e+014	9.9270e+003	3.6730e+008
I-133	1.3552e+004	5.0142e+014	1.6660e+004	6.1642e+008
I-134	3.2887e+003	1.2168e+014	4.0430e+003	1.4959e+008
I-135	1.1152e+004	4.1263e+014	1.3710e+004	5.0727e+008
La-140	2.0547e+001	7.6026e+011	2.5260e+001	9.3462e+005
La-141	5.4338e+000	2.0105e+011	6.6800e+000	2.4716e+005
La-142	3.0821e+000	1.1404e+011	3.7890e+000	1.4019e+005
Mo-99	1.0754e+002	3.9789e+012	1.3220e+002	4.8914e+006
Nb-95	8.3459e+000	3.0880e+011	1.0260e+001	3.7962e+005
Nd-147	3.1391e+000	1.1615e+011	3.8590e+000	1.4278e+005
Np-239	2.2500e+002	8.3249e+012	2.7660e+002	1.0234e+007
Pr-143	7.0143e+000	2.5953e+011	8.6230e+000	3.1905e+005
Pr-144	1.6197e+001	5.9927e+011	1.9911e+001	7.3671e+005
Pu-238	4.9530e-002	1.8326e+009	6.0890e-002	2.2529e+003
Pu-239	5.2613e-002	1.9467e+009	6.4680e-002	2.3932e+003
Pu-240	8.4598e-003	3.1301e+008	1.0400e-002	3.8480e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1754e+001	4.3491e+011	1.4450e+001	5.3465e+005
Rh-103m	9.3218e+001	3.4491e+012	1.1460e+002	4.2401e+006
Rh-105	6.0089e+001	2.2233e+012	7.3870e+001	2.7332e+006
Rh-106	3.7256e+001	1.3785e+012	4.5800e+001	1.6946e+006
Ru-103	9.3464e+001	3.4582e+012	1.1490e+002	4.2513e+006
Ru-105	4.7310e+001	1.7505e+012	5.8160e+001	2.1519e+006
Ru-106	3.7256e+001	1.3785e+012	4.5800e+001	1.6946e+006
Sb-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Sb-129	2.7380e+002	1.0131e+013	3.3660e+002	1.2454e+007
Sr-89	4.4658e+002	1.6523e+013	5.4900e+002	2.0313e+007
Sr-90	5.6981e+001	2.1083e+012	7.0050e+001	2.5919e+006
Sr-91	4.9246e+002	1.8221e+013	6.0540e+002	2.2400e+007
Sr-92	3.6263e+002	1.3417e+013	4.4580e+002	1.6495e+007
Tc-99m	9.7043e+001	3.5906e+012	1.1930e+002	4.4141e+006
Te-127	1.0111e+002	3.7411e+012	1.2430e+002	4.5991e+006
Te-127m	1.7269e+001	6.3896e+011	2.1230e+001	7.8551e+005
Te-129	3.1496e+002	1.1654e+013	3.8720e+002	1.4326e+007
Te-129m	7.2323e+001	2.6759e+012	8.8910e+001	3.2897e+006
Te-131m	2.2313e+002	8.2557e+012	2.7430e+002	1.0149e+007
Te-132	1.6448e+003	6.0857e+013	2.0220e+003	7.4814e+007
Y-90	1.0770e+000	3.9849e+010	1.3240e+000	4.8988e+004
Y-91	5.9015e+000	2.1836e+011	7.2550e+000	2.6844e+005
Y-92	6.4221e+001	2.3762e+012	7.8950e+001	2.9212e+006
Y-93	4.0501e+000	1.4985e+011	4.9790e+000	1.8422e+005
Zr-95	8.3378e+000	3.0850e+011	1.0250e+001	3.7925e+005
Zr-97	7.6073e+000	2.8147e+011	9.3520e+000	3.4602e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

DOS File: ASTCS2.MS5
Run Date: August 10, 2005
Run Time: 4:55:54 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.918e+08	0.000e+00	8.164e-26	0.000e+00	7.003e-27
0.02	7.018e+11	0.000e+00	2.301e-22	0.000e+00	7.971e-24
0.03	7.299e+13	1.326e-129	5.292e-20	1.315e-131	5.245e-22
0.04	1.870e+12	1.371e-62	3.595e-21	6.064e-65	1.590e-23
0.05	8.001e+12	2.659e-37	5.029e-20	7.083e-40	1.340e-22
0.06	2.055e+12	7.659e-27	9.272e-20	1.521e-29	1.842e-22
0.08	8.003e+12	4.676e-17	4.468e-15	7.399e-20	7.071e-18
0.1	9.141e+12	2.648e-13	5.888e-11	4.052e-16	9.009e-14
0.15	1.696e+13	2.489e-09	1.086e-06	4.099e-12	1.789e-09
0.2	7.218e+13	5.789e-07	2.822e-04	1.022e-09	4.981e-07
0.3	5.826e+13	5.117e-05	1.728e-02	9.706e-08	3.278e-05
0.4	2.577e+14	4.710e-03	9.995e-01	9.178e-06	1.947e-03
0.5	5.813e+14	9.983e-02	1.415e+01	1.959e-04	2.777e-02
0.6	5.442e+14	5.416e-01	5.437e+01	1.057e-03	1.061e-01
0.8	6.522e+14	9.213e+00	5.375e+02	1.752e-02	1.022e+00
1.0	3.489e+14	3.474e+01	1.343e+03	6.403e-02	2.476e+00
1.5	3.149e+14	8.269e+02	1.616e+04	1.391e+00	2.719e+01
2.0	6.555e+13	1.318e+03	1.718e+04	2.039e+00	2.656e+01
3.0	5.832e+10	1.347e+01	1.069e+02	1.828e-02	1.450e-01
4.0	2.994e+09	2.918e+00	1.709e+01	3.610e-03	2.114e-02
TOTALS:	3.015e+15	2.206e+03	3.541e+04	3.535e+00	5.755e+01

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.918e+08	0.000e+00	7.243e-26	0.000e+00	6.213e-27
0.02	7.018e+11	0.000e+00	2.042e-22	0.000e+00	7.072e-24
0.03	7.299e+13	1.187e-129	4.696e-20	1.176e-131	4.654e-22
0.04	1.870e+12	1.260e-62	3.190e-21	5.572e-65	1.411e-23
0.05	8.001e+12	2.423e-37	4.462e-20	6.455e-40	1.189e-22
0.06	2.055e+12	6.964e-27	8.227e-20	1.383e-29	1.634e-22
0.08	8.003e+12	4.258e-17	4.070e-15	6.738e-20	6.440e-18
0.1	9.141e+12	2.415e-13	5.369e-11	3.694e-16	8.215e-14
0.15	1.696e+13	2.271e-09	9.914e-07	3.740e-12	1.633e-09
0.2	7.218e+13	5.283e-07	2.575e-04	9.325e-10	4.545e-07
0.3	5.826e+13	4.668e-05	1.576e-02	8.855e-08	2.990e-05
0.4	2.577e+14	4.296e-03	9.113e-01	8.371e-06	1.776e-03
0.5	5.813e+14	9.103e-02	1.290e+01	1.787e-04	2.532e-02
0.6	5.442e+14	4.937e-01	4.956e+01	9.637e-04	9.673e-02
0.8	6.522e+14	8.396e+00	4.897e+02	1.597e-02	9.315e-01
1.0	3.489e+14	3.165e+01	1.224e+03	5.834e-02	2.256e+00
1.5	3.149e+14	7.531e+02	1.472e+04	1.267e+00	2.476e+01
2.0	6.555e+13	1.200e+03	1.564e+04	1.856e+00	2.418e+01
3.0	5.832e+10	1.226e+01	9.725e+01	1.664e-02	1.319e-01
4.0	2.994e+09	2.656e+00	1.555e+01	3.285e-03	1.924e-02
TOTALS:	3.015e+15	2.009e+03	3.224e+04	3.219e+00	5.240e+01

Results - Dose Point # 3 - (228.6,457.2,0) cm

DOS File: ASTCS2.MS5
Run Date: August 10, 2005
Run Time: 4:55:54 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.918e+08	0.000e+00	4.820e-26	0.000e+00	4.134e-27
0.02	7.018e+11	0.000e+00	1.359e-22	0.000e+00	4.706e-24
0.03	7.299e+13	8.776e-130	3.124e-20	8.697e-132	3.097e-22
0.04	1.870e+12	9.248e-63	2.122e-21	4.090e-65	9.387e-24
0.05	8.001e+12	1.762e-37	2.969e-20	4.695e-40	7.910e-23
0.06	2.055e+12	5.084e-27	5.474e-20	1.010e-29	1.087e-22
0.08	8.003e+12	3.124e-17	2.986e-15	4.944e-20	4.726e-18
0.1	9.141e+12	1.775e-13	3.948e-11	2.716e-16	6.039e-14
0.15	1.696e+13	1.672e-09	7.299e-07	2.754e-12	1.202e-09
0.2	7.218e+13	3.891e-07	1.896e-04	6.867e-10	3.347e-07
0.3	5.826e+13	3.438e-05	1.161e-02	6.521e-08	2.201e-05
0.4	2.577e+14	3.163e-03	6.707e-01	6.163e-06	1.307e-03
0.5	5.813e+14	6.700e-02	9.490e+00	1.315e-04	1.863e-02
0.6	5.442e+14	3.633e-01	3.646e+01	7.091e-04	7.116e-02
0.8	6.522e+14	6.176e+00	3.601e+02	1.175e-02	6.850e-01
1.0	3.489e+14	2.327e+01	8.997e+02	4.290e-02	1.658e+00
1.5	3.149e+14	5.535e+02	1.081e+04	9.312e-01	1.819e+01
2.0	6.555e+13	8.819e+02	1.149e+04	1.364e+00	1.776e+01
3.0	5.832e+10	9.005e+00	7.141e+01	1.222e-02	9.688e-02
4.0	2.994e+09	1.950e+00	1.141e+01	2.412e-03	1.412e-02
TOTALS:	3.015e+15	1.476e+03	2.369e+04	2.365e+00	3.850e+01

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.918e+08	0.000e+00	3.457e-26	0.000e+00	2.965e-27
0.02	7.018e+11	0.000e+00	9.745e-23	0.000e+00	3.376e-24
0.03	7.299e+13	6.876e-130	2.241e-20	6.815e-132	2.221e-22
0.04	1.870e+12	7.185e-63	1.522e-21	3.178e-65	6.733e-24
0.05	8.001e+12	1.377e-37	2.130e-20	3.669e-40	5.674e-23
0.06	2.055e+12	3.981e-27	3.927e-20	7.908e-30	7.799e-23
0.08	8.003e+12	2.450e-17	2.343e-15	3.878e-20	3.707e-18
0.1	9.141e+12	1.394e-13	3.101e-11	2.132e-16	4.744e-14
0.15	1.696e+13	1.315e-09	5.741e-07	2.166e-12	9.455e-10
0.2	7.218e+13	3.062e-07	1.493e-04	5.404e-10	2.634e-07
0.3	5.826e+13	2.707e-05	9.140e-03	5.134e-08	1.734e-05
0.4	2.577e+14	2.491e-03	5.284e-01	4.854e-06	1.030e-03
0.5	5.813e+14	5.278e-02	7.478e+00	1.036e-04	1.468e-02
0.6	5.442e+14	2.863e-01	2.873e+01	5.588e-04	5.608e-02
0.8	6.522e+14	4.867e+00	2.839e+02	9.258e-03	5.400e-01
1.0	3.489e+14	1.835e+01	7.093e+02	3.382e-02	1.307e+00
1.5	3.149e+14	4.364e+02	8.526e+03	7.342e-01	1.434e+01
2.0	6.555e+13	6.955e+02	9.058e+03	1.075e+00	1.401e+01
3.0	5.832e+10	7.102e+00	5.632e+01	9.636e-03	7.641e-02
4.0	2.994e+09	1.538e+00	9.003e+00	1.903e-03	1.114e-02
TOTALS:	3.015e+15	1.164e+03	1.868e+04	1.865e+00	3.036e+01

Results - Dose Point # 5 - (441.96,457.2,0) cm

DOS File: ASTCS2.MS5
Run Date: August 10, 2005
Run Time: 4:55:54 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.918e+08	0.000e+00	1.806e-26	0.000e+00	1.549e-27
0.02	7.018e+11	0.000e+00	5.089e-23	0.000e+00	1.763e-24
0.03	7.299e+13	4.238e-130	1.170e-20	4.200e-132	1.160e-22
0.04	1.870e+12	4.527e-63	7.951e-22	2.002e-65	3.516e-24
0.05	8.001e+12	8.737e-38	1.112e-20	2.327e-40	2.963e-23
0.06	2.055e+12	2.534e-27	2.051e-20	5.033e-30	4.073e-23
0.08	8.003e+12	1.566e-17	1.498e-15	2.478e-20	2.370e-18
0.1	9.141e+12	8.927e-14	1.988e-11	1.366e-16	3.041e-14
0.15	1.696e+13	8.450e-10	3.694e-07	1.391e-12	6.083e-10
0.2	7.218e+13	1.971e-07	9.624e-05	3.479e-10	1.699e-07
0.3	5.826e+13	1.747e-05	5.907e-03	3.314e-08	1.121e-05
0.4	2.577e+14	1.610e-03	3.420e-01	3.138e-06	6.664e-04
0.5	5.813e+14	3.416e-02	4.845e+00	6.705e-05	9.510e-03
0.6	5.442e+14	1.854e-01	1.863e+01	3.619e-04	3.636e-02
0.8	6.522e+14	3.157e+00	1.843e+02	6.005e-03	3.505e-01
1.0	3.489e+14	1.191e+01	4.608e+02	2.195e-02	8.494e-01
1.5	3.149e+14	2.836e+02	5.543e+03	4.772e-01	9.326e+00
2.0	6.555e+13	4.521e+02	5.888e+03	6.992e-01	9.105e+00
3.0	5.832e+10	4.613e+00	3.654e+01	6.258e-03	4.958e-02
4.0	2.994e+09	9.972e-01	5.826e+00	1.234e-03	7.207e-03
TOTALS:	3.015e+15	7.567e+02	1.214e+04	1.212e+00	1.973e+01

Results - Dose Point # 6 - (594.36,457.2,0) cm

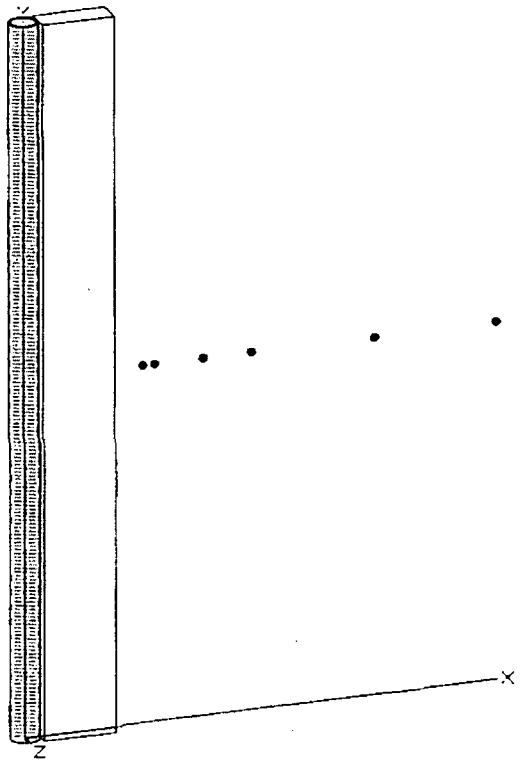
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.918e+08	0.000e+00	1.097e-26	0.000e+00	9.410e-28
0.02	7.018e+11	0.000e+00	3.092e-23	0.000e+00	1.071e-24
0.03	7.299e+13	2.971e-130	7.112e-21	2.944e-132	7.048e-23
0.04	1.870e+12	3.229e-63	4.831e-22	1.428e-65	2.136e-24
0.05	8.001e+12	6.272e-38	6.758e-21	1.671e-40	1.800e-23
0.06	2.055e+12	1.825e-27	1.246e-20	3.625e-30	2.475e-23
0.08	8.003e+12	1.132e-17	1.083e-15	1.791e-20	1.713e-18
0.1	9.141e+12	6.464e-14	1.441e-11	9.890e-17	2.205e-14
0.15	1.696e+13	6.138e-10	2.688e-07	1.011e-12	4.426e-10
0.2	7.218e+13	1.435e-07	7.017e-05	2.532e-10	1.238e-07
0.3	5.826e+13	1.275e-05	4.318e-03	2.418e-08	8.191e-06
0.4	2.577e+14	1.177e-03	2.503e-01	2.294e-06	4.878e-04
0.5	5.813e+14	2.500e-02	3.549e+00	4.907e-05	6.967e-03
0.6	5.442e+14	1.358e-01	1.365e+01	2.651e-04	2.665e-02
0.8	6.522e+14	2.314e+00	1.351e+02	4.401e-03	2.569e-01
1.0	3.489e+14	8.728e+00	3.375e+02	1.609e-02	6.222e-01
1.5	3.149e+14	2.074e+02	4.047e+03	3.490e-01	6.809e+00
2.0	6.555e+13	3.296e+02	4.280e+03	5.097e-01	6.618e+00
3.0	5.832e+10	3.339e+00	2.633e+01	4.530e-03	3.572e-02
4.0	2.994e+09	7.172e-01	4.166e+00	8.873e-04	5.154e-03
TOTALS:	3.015e+15	5.523e+02	8.847e+03	8.849e-01	1.438e+01

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

Page : 1
DOS File: ASTCS4.MS5
Run Date: August 10, 2005
Run Time: 5:28:40 PM
Duration: 00:03:24

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

Case Title: Control Room
Description: 14 inch core spray - Time = 4 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.1030e-003	4.0812e+007	1.3560e-003	5.0172e+001
Ba-137m	8.8725e+002	3.2828e+013	1.0907e+003	4.0357e+007
Ba-139	1.1323e+002	4.1895e+012	1.3920e+002	5.1504e+006
Ba-140	8.4272e+002	3.1181e+013	1.0360e+003	3.8332e+007
Ce-141	1.9466e+001	7.2023e+011	2.3930e+001	8.8541e+005
Ce-143	1.6643e+001	6.1579e+011	2.0460e+001	7.5702e+005
Ce-144	1.6391e+001	6.0646e+011	2.0150e+001	7.4555e+005
Cm-242	2.8836e-001	1.0669e+010	3.5450e-001	1.3117e+004
Cm-244	1.6911e-002	6.2572e+008	2.0790e-002	7.6923e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7294e-001	6.3987e+009	2.1260e-001	7.8662e+003
Cs-134	1.2454e+003	4.6079e+013	1.5310e+003	5.6647e+007
Cs-136	3.9427e+002	1.4588e+013	4.8470e+002	1.7934e+007
Cs-137	9.3790e+002	3.4702e+013	1.1530e+003	4.2661e+007

DOS File: ASTCS4.MS5
Run Date: August 10, 2005
Run Time: 5:28:40 PM
Duration: 00:03:24

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
I-131	6.8573e+003	2.5372e+014	8.4300e+003	3.1191e+008
I-132	5.1556e+003	1.9076e+014	6.3380e+003	2.3451e+008
I-133	1.2649e+004	4.6801e+014	1.5550e+004	5.7535e+008
I-134	6.7483e+002	2.4969e+013	8.2960e+002	3.0695e+007
I-135	9.0210e+003	3.3378e+014	1.1090e+004	4.1033e+008
La-140	4.8392e+001	1.7905e+012	5.9490e+001	2.2011e+006
La-141	3.8093e+000	1.4095e+011	4.6830e+000	1.7327e+005
La-142	1.2511e+000	4.6290e+010	1.5380e+000	5.6906e+004
Mo-99	1.0502e+002	3.8856e+012	1.2910e+002	4.7767e+006
Nb-95	8.3215e+000	3.0790e+011	1.0230e+001	3.7851e+005
Nd-147	3.1155e+000	1.1527e+011	3.8300e+000	1.4171e+005
Np-239	2.1898e+002	8.1022e+012	2.6920e+002	9.9604e+006
Pr-143	7.0395e+000	2.6046e+011	8.6540e+000	3.2020e+005
Pr-144	1.6156e+001	5.9779e+011	1.9862e+001	7.3489e+005
Pu-238	4.9408e-002	1.8281e+009	6.0740e-002	2.2474e+003
Pu-239	5.2499e-003	1.9425e+008	6.4540e-003	2.3880e+002
Pu-240	8.4354e-003	3.1211e+008	1.0370e-002	3.8369e+002
Pu-241	2.0816e+000	7.7019e+010	2.5590e+000	9.4683e+004
Rb-86	1.1689e+001	4.3250e+011	1.4370e+001	5.3169e+005
Rh-103m	9.2813e+001	3.4341e+012	1.1410e+002	4.2217e+006
Rh-105	5.9194e+001	2.1902e+012	7.2770e+001	2.6925e+006
Rh-106	3.7158e+001	1.3748e+012	4.5680e+001	1.6902e+006
Ru-103	9.3057e+001	3.4431e+012	1.1440e+002	4.2328e+006
Ru-105	3.4539e+001	1.2779e+012	4.2460e+001	1.5710e+006
Ru-106	3.7158e+001	1.3748e+012	4.5680e+001	1.6902e+006
Sb-127	9.8833e+001	3.6568e+012	1.2150e+002	4.4955e+006
Sb-129	1.9815e+002	7.3317e+012	2.4360e+002	9.0132e+006
Sr-89	4.4503e+002	1.6466e+013	5.4710e+002	2.0243e+007
Sr-90	5.6843e+001	2.1032e+012	6.9880e+001	2.5856e+006
Sr-91	4.2453e+002	1.5708e+013	5.2190e+002	1.9310e+007
Sr-92	2.1694e+002	8.0269e+012	2.6670e+002	9.8679e+006
Tc-99m	9.6230e+001	3.5605e+012	1.1830e+002	4.3771e+006
Te-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Te-127m	1.7229e+001	6.3746e+011	2.1180e+001	7.8366e+005
Te-129	2.5404e+002	9.3994e+012	3.1230e+002	1.1555e+007
Te-129m	7.2111e+001	2.6681e+012	8.8650e+001	3.2800e+006
Te-131m	2.1247e+002	7.8614e+012	2.6120e+002	9.6644e+006
Te-132	1.6122e+003	5.9653e+013	1.9820e+003	7.3334e+007
Y-90	2.2695e+000	8.3971e+010	2.7900e+000	1.0323e+005
Y-91	6.0707e+000	2.2462e+011	7.4630e+000	2.7613e+005
Y-92	1.3446e+002	4.9751e+012	1.6530e+002	6.1161e+006
Y-93	3.5222e+000	1.3032e+011	4.3300e+000	1.6021e+005
Zr-95	8.3134e+000	3.0759e+011	1.0220e+001	3.7814e+005
Zr-97	6.9915e+000	2.5869e+011	8.5950e+000	3.1802e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

DOS File: ASTCS4.MS5
Run Date: August 10, 2005
Run Time: 5:28:40 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.729e+08	0.000e+00	7.771e-26	0.000e+00	6.665e-27
0.02	6.925e+11	0.000e+00	2.271e-22	0.000e+00	7.866e-24
0.03	6.891e+13	1.252e-129	4.997e-20	1.241e-131	4.952e-22
0.04	1.802e+12	1.322e-62	3.465e-21	5.845e-65	1.532e-23
0.05	7.843e+12	2.606e-37	4.930e-20	6.943e-40	1.313e-22
0.06	2.036e+12	7.586e-27	9.185e-20	1.507e-29	1.824e-22
0.08	7.915e+12	4.624e-17	4.419e-15	7.317e-20	6.993e-18
0.1	8.893e+12	2.577e-13	5.729e-11	3.942e-16	8.765e-14
0.15	1.069e+13	1.569e-09	6.850e-07	2.584e-12	1.128e-09
0.2	6.619e+13	5.309e-07	2.588e-04	9.370e-10	4.568e-07
0.3	5.156e+13	4.528e-05	1.530e-02	8.590e-08	2.901e-05
0.4	2.365e+14	4.322e-03	9.172e-01	8.422e-06	1.787e-03
0.5	5.068e+14	8.703e-02	1.233e+01	1.708e-04	2.421e-02
0.6	3.712e+14	3.694e-01	3.708e+01	7.210e-04	7.239e-02
0.8	3.682e+14	5.201e+00	3.034e+02	9.893e-03	5.772e-01
1.0	2.442e+14	2.431e+01	9.401e+02	4.480e-02	1.733e+00
1.5	2.374e+14	6.235e+02	1.219e+04	1.049e+00	2.050e+01
2.0	4.550e+13	9.151e+02	1.192e+04	1.415e+00	1.844e+01
3.0	7.644e+10	1.766e+01	1.401e+02	2.395e-02	1.900e-01
4.0	1.215e+09	1.185e+00	6.936e+00	1.465e-03	8.581e-03
TOTALS:	2.236e+15	1.587e+03	2.555e+04	2.545e+00	4.155e+01

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.729e+08	0.000e+00	6.894e-26	0.000e+00	5.913e-27
0.02	6.925e+11	0.000e+00	2.015e-22	0.000e+00	6.979e-24
0.03	6.891e+13	1.121e-129	4.433e-20	1.111e-131	4.393e-22
0.04	1.802e+12	1.214e-62	3.074e-21	5.371e-65	1.360e-23
0.05	7.843e+12	2.375e-37	4.374e-20	6.328e-40	1.165e-22
0.06	2.036e+12	6.898e-27	8.149e-20	1.370e-29	1.619e-22
0.08	7.915e+12	4.211e-17	4.025e-15	6.664e-20	6.369e-18
0.1	8.893e+12	2.349e-13	5.224e-11	3.594e-16	7.992e-14
0.15	1.069e+13	1.432e-09	6.250e-07	2.358e-12	1.029e-09
0.2	6.619e+13	4.845e-07	2.362e-04	8.552e-10	4.168e-07
0.3	5.156e+13	4.131e-05	1.395e-02	7.837e-08	2.646e-05
0.4	2.365e+14	3.942e-03	8.363e-01	7.681e-06	1.629e-03
0.5	5.068e+14	7.936e-02	1.124e+01	1.558e-04	2.207e-02
0.6	3.712e+14	3.367e-01	3.380e+01	6.573e-04	6.597e-02
0.8	3.682e+14	4.740e+00	2.765e+02	9.016e-03	5.259e-01
1.0	2.442e+14	2.215e+01	8.564e+02	4.082e-02	1.579e+00
1.5	2.374e+14	5.678e+02	1.110e+04	9.554e-01	1.867e+01
2.0	4.550e+13	8.332e+02	1.085e+04	1.288e+00	1.678e+01
3.0	7.644e+10	1.607e+01	1.275e+02	2.180e-02	1.729e-01
4.0	1.215e+09	1.078e+00	6.311e+00	1.334e-03	7.808e-03
TOTALS:	2.236e+15	1.446e+03	2.326e+04	2.318e+00	3.783e+01

Results - Dose Point # 3 - (228.6,457.2,0) cm

DOS File: ASTCS4.MS5
Run Date: August 10, 2005
Run Time: 5:28:40 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.729e+08	0.000e+00	4.588e-26	0.000e+00	3.935e-27
0.02	6.925e+11	0.000e+00	1.341e-22	0.000e+00	4.644e-24
0.03	6.891e+13	8.285e-130	2.950e-20	8.211e-132	2.923e-22
0.04	1.802e+12	8.913e-63	2.046e-21	3.942e-65	9.047e-24
0.05	7.843e+12	1.727e-37	2.910e-20	4.602e-40	7.753e-23
0.06	2.036e+12	5.036e-27	5.422e-20	1.000e-29	1.077e-22
0.08	7.915e+12	3.090e-17	2.954e-15	4.890e-20	4.674e-18
0.1	8.893e+12	1.727e-13	3.841e-11	2.642e-16	5.876e-14
0.15	1.069e+13	1.054e-09	4.602e-07	1.736e-12	7.578e-10
0.2	6.619e+13	3.568e-07	1.739e-04	6.298e-10	3.069e-07
0.3	5.156e+13	3.042e-05	1.027e-02	5.771e-08	1.948e-05
0.4	2.365e+14	2.902e-03	6.155e-01	5.655e-06	1.199e-03
0.5	5.068e+14	5.841e-02	8.273e+00	1.146e-04	1.624e-02
0.6	3.712e+14	2.478e-01	2.486e+01	4.837e-04	4.853e-02
0.8	3.682e+14	3.487e+00	2.033e+02	6.632e-03	3.867e-01
1.0	2.442e+14	1.629e+01	6.296e+02	3.002e-02	1.160e+00
1.5	2.374e+14	4.173e+02	8.153e+03	7.021e-01	1.372e+01
2.0	4.550e+13	6.122e+02	7.972e+03	9.466e-01	1.233e+01
3.0	7.644e+10	1.180e+01	9.359e+01	1.601e-02	1.270e-01
4.0	1.215e+09	7.915e-01	4.633e+00	9.791e-04	5.732e-03
TOTALS:	2.236e+15	1.062e+03	1.709e+04	1.703e+00	2.779e+01

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.729e+08	0.000e+00	3.291e-26	0.000e+00	2.822e-27
0.02	6.925e+11	0.000e+00	9.616e-23	0.000e+00	3.331e-24
0.03	6.891e+13	6.492e-130	2.116e-20	6.434e-132	2.097e-22
0.04	1.802e+12	6.925e-63	1.467e-21	3.063e-65	6.490e-24
0.05	7.843e+12	1.350e-37	2.088e-20	3.597e-40	5.561e-23
0.06	2.036e+12	3.943e-27	3.889e-20	7.833e-30	7.725e-23
0.08	7.915e+12	2.423e-17	2.317e-15	3.835e-20	3.666e-18
0.1	8.893e+12	1.356e-13	3.017e-11	2.075e-16	4.615e-14
0.15	1.069e+13	8.291e-10	3.620e-07	1.365e-12	5.961e-10
0.2	6.619e+13	2.808e-07	1.369e-04	4.956e-10	2.416e-07
0.3	5.156e+13	2.395e-05	8.089e-03	4.544e-08	1.534e-05
0.4	2.365e+14	2.286e-03	4.849e-01	4.454e-06	9.448e-04
0.5	5.068e+14	4.601e-02	6.519e+00	9.032e-05	1.280e-02
0.6	3.712e+14	1.952e-01	1.960e+01	3.811e-04	3.825e-02
0.8	3.682e+14	2.748e+00	1.603e+02	5.227e-03	3.048e-01
1.0	2.442e+14	1.284e+01	4.963e+02	2.366e-02	9.149e-01
1.5	2.374e+14	3.291e+02	6.429e+03	5.536e-01	1.082e+01
2.0	4.550e+13	4.827e+02	6.287e+03	7.465e-01	9.722e+00
3.0	7.644e+10	9.308e+00	7.381e+01	1.263e-02	1.001e-01
4.0	1.215e+09	6.243e-01	3.654e+00	7.723e-04	4.521e-03
TOTALS:	2.236e+15	8.375e+02	1.348e+04	1.343e+00	2.191e+01

Results - Dose Point # 5 - (441.96,457.2,0) cm

DOS File: ASTCS4.MS5
Run Date: August 10, 2005
Run Time: 5:28:40 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.729e+08	0.000e+00	1.719e-26	0.000e+00	1.474e-27
0.02	6.925e+11	0.000e+00	5.022e-23	0.000e+00	1.740e-24
0.03	6.891e+13	4.001e-130	1.105e-20	3.965e-132	1.095e-22
0.04	1.802e+12	4.364e-63	7.663e-22	1.930e-65	3.389e-24
0.05	7.843e+12	8.564e-38	1.090e-20	2.281e-40	2.904e-23
0.06	2.036e+12	2.510e-27	2.031e-20	4.985e-30	4.035e-23
0.08	7.915e+12	1.548e-17	1.481e-15	2.450e-20	2.344e-18
0.1	8.893e+12	8.685e-14	1.934e-11	1.329e-16	2.959e-14
0.15	1.069e+13	5.327e-10	2.329e-07	8.773e-13	3.835e-10
0.2	6.619e+13	1.808e-07	8.826e-05	3.191e-10	1.558e-07
0.3	5.156e+13	1.546e-05	5.228e-03	2.933e-08	9.917e-06
0.4	2.365e+14	1.478e-03	3.138e-01	2.879e-06	6.115e-04
0.5	5.068e+14	2.978e-02	4.224e+00	5.845e-05	8.291e-03
0.6	3.712e+14	1.265e-01	1.271e+01	2.469e-04	2.480e-02
0.8	3.682e+14	1.782e+00	1.040e+02	3.390e-03	1.979e-01
1.0	2.442e+14	8.334e+00	3.224e+02	1.536e-02	5.943e-01
1.5	2.374e+14	2.139e+02	4.180e+03	3.598e-01	7.032e+00
2.0	4.550e+13	3.138e+02	4.087e+03	4.853e-01	6.320e+00
3.0	7.644e+10	6.046e+00	4.789e+01	8.203e-03	6.498e-02
4.0	1.215e+09	4.048e-01	2.365e+00	5.008e-04	2.926e-03
TOTALS:	2.236e+15	5.444e+02	8.760e+03	8.729e-01	1.425e+01

Results - Dose Point # 6 - (594.36,457.2,0) cm

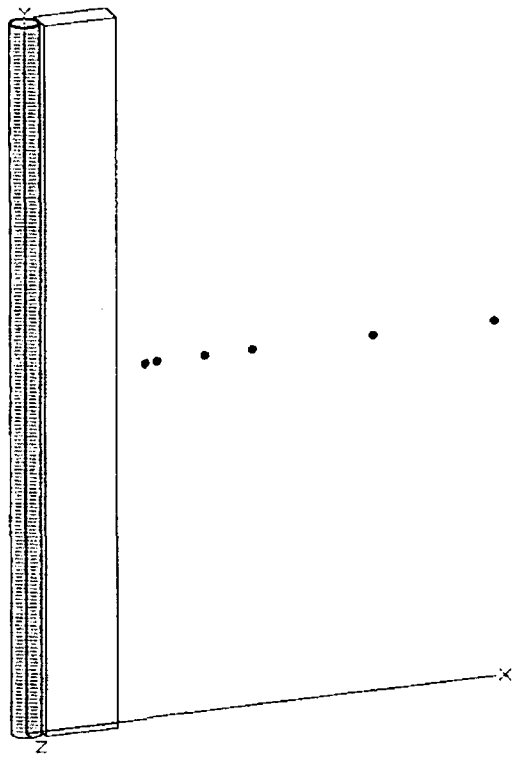
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.729e+08	0.000e+00	1.044e-26	0.000e+00	8.956e-28
0.02	6.925e+11	0.000e+00	3.051e-23	0.000e+00	1.057e-24
0.03	6.891e+13	2.805e-130	6.714e-21	2.780e-132	6.654e-23
0.04	1.802e+12	3.112e-63	4.656e-22	1.377e-65	2.059e-24
0.05	7.843e+12	6.148e-38	6.625e-21	1.638e-40	1.765e-23
0.06	2.036e+12	1.808e-27	1.234e-20	3.591e-30	2.451e-23
0.08	7.915e+12	1.119e-17	1.071e-15	1.771e-20	1.695e-18
0.1	8.893e+12	6.289e-14	1.402e-11	9.622e-17	2.145e-14
0.15	1.069e+13	3.870e-10	1.694e-07	6.373e-13	2.790e-10
0.2	6.619e+13	1.316e-07	6.435e-05	2.322e-10	1.136e-07
0.3	5.156e+13	1.128e-05	3.821e-03	2.140e-08	7.249e-06
0.4	2.365e+14	1.080e-03	2.297e-01	2.105e-06	4.476e-04
0.5	5.068e+14	2.180e-02	3.094e+00	4.278e-05	6.074e-03
0.6	3.712e+14	9.263e-02	9.313e+00	1.808e-04	1.818e-02
0.8	3.682e+14	1.306e+00	7.626e+01	2.485e-03	1.450e-01
1.0	2.442e+14	6.107e+00	2.362e+02	1.126e-02	4.354e-01
1.5	2.374e+14	1.564e+02	3.052e+03	2.632e-01	5.134e+00
2.0	4.550e+13	2.288e+02	2.970e+03	3.538e-01	4.593e+00
3.0	7.644e+10	4.376e+00	3.451e+01	5.938e-03	4.682e-02
4.0	1.215e+09	2.911e-01	1.691e+00	3.602e-04	2.092e-03
TOTALS:	2.236e+15	3.974e+02	6.383e+03	6.372e-01	1.038e+01

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

Page : 1
DOS File: ASTCS8.MS5
Date: August 10, 2005
Time: 5:32:05 PM
Duration: 00:03:24

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

Case Title: Control Room
Description: 14 inch core spray - Time = 8 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.0990e-003	4.0661e+007	1.3510e-003	4.9987e+001
Ba-137m	8.8263e+002	3.2657e+013	1.0851e+003	4.0147e+007
Ba-139	1.5081e+001	5.5800e+011	1.8540e+001	6.8598e+005
Ba-140	8.3052e+002	3.0729e+013	1.0210e+003	3.7777e+007
Ce-141	1.9311e+001	7.1451e+011	2.3740e+001	8.7838e+005
Ce-143	1.5228e+001	5.6342e+011	1.8720e+001	6.9264e+005
Ce-144	1.6301e+001	6.0315e+011	2.0040e+001	7.4148e+005
Cm-242	2.8682e-001	1.0612e+010	3.5260e-001	1.3046e+004
Cm-244	1.6830e-002	6.2271e+008	2.0690e-002	7.6553e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7204e-001	6.3656e+009	2.1150e-001	7.8255e+003
Cs-134	1.2397e+003	4.5868e+013	1.5240e+003	5.6388e+007
Cs-136	3.8899e+002	1.4393e+013	4.7820e+002	1.7693e+007
Cs-137	9.3302e+002	3.4522e+013	1.1470e+003	4.2439e+007

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Run Date: August 10, 2005
Run Time: 5:32:05 PM
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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	6.7288e+003	2.4896e+014	8.2720e+003	3.0606e+008
I-132	2.6534e+003	9.8177e+013	3.2620e+003	1.2069e+008
I-133	1.1014e+004	4.0752e+014	1.3540e+004	5.0098e+008
I-134	2.8413e+001	1.0513e+012	3.4930e+001	1.2924e+006
I-135	5.8999e+003	2.1830e+014	7.2530e+003	2.6836e+008
La-140	1.0054e+002	3.7200e+012	1.2360e+002	4.5732e+006
La-141	1.8725e+000	6.9284e+010	2.3020e+000	8.5174e+004
La-142	2.0613e-001	7.6266e+009	2.5340e-001	9.3758e+003
Mo-99	1.0022e+002	3.7080e+012	1.2320e+002	4.5584e+006
Nb-95	8.2808e+000	3.0639e+011	1.0180e+001	3.7666e+005
Nd-147	3.0675e+000	1.1350e+011	3.7710e+000	1.3953e+005
Np-239	2.0751e+002	7.6778e+012	2.5510e+002	9.4387e+006
Pr-143	7.0810e+000	2.6200e+011	8.7050e+000	3.2209e+005
Pr-144	1.6068e+001	5.9452e+011	1.9753e+001	7.3088e+005
Pu-238	4.9172e-002	1.8194e+009	6.0450e-002	2.2367e+003
Pu-239	5.2272e-003	1.9341e+008	6.4260e-003	2.3776e+002
Pu-240	8.3947e-003	3.1060e+008	1.0320e-002	3.8184e+002
Pu-241	2.0710e+000	7.6628e+010	2.5460e+000	9.4202e+004
Rb-86	1.1559e+001	4.2768e+011	1.4210e+001	5.2577e+005
Rh-103m	9.2083e+001	3.4071e+012	1.1320e+002	4.1885e+006
Rh-105	5.6388e+001	2.0863e+012	6.9320e+001	2.5648e+006
Rh-106	3.6963e+001	1.3676e+012	4.5440e+001	1.6813e+006
Ru-103	9.2325e+001	3.4160e+012	1.1350e+002	4.1995e+006
Ru-105	1.8408e+001	6.8110e+011	2.2630e+001	8.3731e+005
Ru-106	3.6963e+001	1.3676e+012	4.5440e+001	1.6813e+006
Sb-127	9.5498e+001	3.5334e+012	1.1740e+002	4.3438e+006
Sb-129	1.0379e+002	3.8404e+012	1.2760e+002	4.7212e+006
Sr-89	4.4186e+002	1.6349e+013	5.4320e+002	2.0098e+007
Sr-90	5.6567e+001	2.0930e+012	6.9540e+001	2.5730e+006
Sr-91	3.1553e+002	1.1675e+013	3.8790e+002	1.4352e+007
Sr-92	7.7602e+001	2.8713e+012	9.5400e+001	3.5298e+006
Tc-99m	9.3790e+001	3.4702e+012	1.1530e+002	4.2661e+006
Te-127	9.9240e+001	3.6719e+012	1.2200e+002	4.5140e+006
Te-127m	1.7147e+001	6.3445e+011	2.1080e+001	7.7996e+005
Te-129	1.5976e+002	5.9111e+012	1.9640e+002	7.2668e+006
Te-129m	7.1623e+001	2.6501e+012	8.8050e+001	3.2578e+006
Te-131m	1.9279e+002	7.1331e+012	2.3700e+002	8.7690e+006
Te-132	1.5488e+003	5.7305e+013	1.9040e+003	7.0448e+007
Y-90	4.5626e+000	1.6882e+011	5.6090e+000	2.0753e+005
Y-91	6.3326e+000	2.3431e+011	7.7850e+000	2.8805e+005
Y-92	1.3048e+002	4.8276e+012	1.6040e+002	5.9348e+006
Y-93	2.6640e+000	9.8569e+010	3.2750e+000	1.2117e+005
Zr-95	8.2564e-002	3.0549e+009	1.0150e-001	3.7555e+003
Zr-97	5.9048e+000	2.1848e+011	7.2590e+000	2.6858e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

DOS File: ASTCS8.MS5
Run Date: August 10, 2005
Run Time: 5:32:05 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.422e+08	0.000e+00	7.131e-26	0.000e+00	6.116e-27
0.02	6.742e+11	0.000e+00	2.211e-22	0.000e+00	7.657e-24
0.03	6.472e+13	1.176e-129	4.693e-20	1.166e-131	4.651e-22
0.04	1.738e+12	1.275e-62	3.342e-21	5.638e-65	1.478e-23
0.05	7.534e+12	2.504e-37	4.736e-20	6.670e-40	1.262e-22
0.06	1.999e+12	7.449e-27	9.018e-20	1.479e-29	1.791e-22
0.08	7.745e+12	4.525e-17	4.324e-15	7.160e-20	6.843e-18
0.1	8.428e+12	2.442e-13	5.429e-11	3.736e-16	8.306e-14
0.15	8.493e+12	1.247e-09	5.442e-07	2.053e-12	8.961e-10
0.2	6.050e+13	4.853e-07	2.366e-04	8.565e-10	4.176e-07
0.3	4.401e+13	3.866e-05	1.306e-02	7.333e-08	2.477e-05
0.4	2.208e+14	4.036e-03	8.563e-01	7.863e-06	1.668e-03
0.5	4.188e+14	7.192e-02	1.019e+01	1.412e-04	2.001e-02
0.6	2.411e+14	2.400e-01	2.409e+01	4.684e-04	4.703e-02
0.8	2.206e+14	3.116e+00	1.818e+02	5.926e-03	3.457e-01
1.0	1.548e+14	1.541e+01	5.960e+02	2.841e-02	1.099e+00
1.5	1.524e+14	4.003e+02	7.823e+03	6.734e-01	1.316e+01
2.0	2.774e+13	5.580e+02	7.270e+03	8.629e-01	1.124e+01
3.0	1.346e+11	3.108e+01	2.465e+02	4.216e-02	3.345e-01
4.0	2.002e+08	1.952e-01	1.143e+00	2.414e-04	1.414e-03
TOTALS:	1.642e+15	1.008e+03	1.615e+04	1.614e+00	2.625e+01

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.422e+08	0.000e+00	6.327e-26	0.000e+00	5.426e-27
0.02	6.742e+11	0.000e+00	1.961e-22	0.000e+00	6.794e-24
0.03	6.472e+13	1.052e-129	4.163e-20	1.043e-131	4.126e-22
0.04	1.738e+12	1.171e-62	2.965e-21	5.180e-65	1.311e-23
0.05	7.534e+12	2.282e-37	4.202e-20	6.079e-40	1.119e-22
0.06	1.999e+12	6.772e-27	8.001e-20	1.345e-29	1.589e-22
0.08	7.745e+12	4.120e-17	3.938e-15	6.521e-20	6.232e-18
0.1	8.428e+12	2.227e-13	4.951e-11	3.406e-16	7.574e-14
0.15	8.493e+12	1.138e-09	4.966e-07	1.873e-12	8.177e-10
0.2	6.050e+13	4.429e-07	2.159e-04	7.816e-10	3.810e-07
0.3	4.401e+13	3.527e-05	1.191e-02	6.690e-08	2.259e-05
0.4	2.208e+14	3.681e-03	7.808e-01	7.172e-06	1.521e-03
0.5	4.188e+14	6.558e-02	9.292e+00	1.287e-04	1.824e-02
0.6	2.411e+14	2.188e-01	2.196e+01	4.270e-04	4.286e-02
0.8	2.206e+14	2.839e+00	1.656e+02	5.401e-03	3.150e-01
1.0	1.548e+14	1.404e+01	5.429e+02	2.588e-02	1.001e+00
1.5	1.524e+14	3.645e+02	7.123e+03	6.133e-01	1.198e+01
2.0	2.774e+13	5.081e+02	6.618e+03	7.857e-01	1.023e+01
3.0	1.346e+11	2.829e+01	2.244e+02	3.838e-02	3.044e-01
4.0	2.002e+08	1.776e-01	1.040e+00	2.197e-04	1.286e-03
TOTALS:	1.642e+15	9.183e+02	1.471e+04	1.469e+00	2.390e+01

Results - Dose Point # 3 - (228.6,457.2,0) cm

DOS File: ASTCS8.MS5
Run Date: August 10, 2005
Run Time: 5:32:05 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.422e+08	0.000e+00	4.210e-26	0.000e+00	3.611e-27
0.02	6.742e+11	0.000e+00	1.305e-22	0.000e+00	4.521e-24
0.03	6.472e+13	7.781e-130	2.770e-20	7.711e-132	2.746e-22
0.04	1.738e+12	8.598e-63	1.973e-21	3.803e-65	8.727e-24
0.05	7.534e+12	1.660e-37	2.796e-20	4.421e-40	7.448e-23
0.06	1.999e+12	4.945e-27	5.324e-20	9.822e-30	1.057e-22
0.08	7.745e+12	3.023e-17	2.890e-15	4.784e-20	4.573e-18
0.1	8.428e+12	1.637e-13	3.640e-11	2.504e-16	5.569e-14
0.15	8.493e+12	8.376e-10	3.656e-07	1.379e-12	6.020e-10
0.2	6.050e+13	3.262e-07	1.590e-04	5.757e-10	2.806e-07
0.3	4.401e+13	2.597e-05	8.768e-03	4.926e-08	1.663e-05
0.4	2.208e+14	2.710e-03	5.747e-01	5.280e-06	1.120e-03
0.5	4.188e+14	4.827e-02	6.837e+00	9.474e-05	1.342e-02
0.6	2.411e+14	1.610e-01	1.615e+01	3.142e-04	3.153e-02
0.8	2.206e+14	2.089e+00	1.218e+02	3.973e-03	2.317e-01
1.0	1.548e+14	1.032e+01	3.991e+02	1.903e-02	7.357e-01
1.5	1.524e+14	2.679e+02	5.234e+03	4.508e-01	8.806e+00
2.0	2.774e+13	3.733e+02	4.861e+03	5.773e-01	7.517e+00
3.0	1.346e+11	2.077e+01	1.647e+02	2.818e-02	2.235e-01
4.0	2.002e+08	1.304e-01	7.634e-01	1.613e-04	9.444e-04
TOTALS:	1.642e+15	6.747e+02	1.081e+04	1.080e+00	1.756e+01

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.422e+08	0.000e+00	3.020e-26	0.000e+00	2.590e-27
0.02	6.742e+11	0.000e+00	9.361e-23	0.000e+00	3.243e-24
0.03	6.472e+13	6.097e-130	1.987e-20	6.042e-132	1.969e-22
0.04	1.738e+12	6.680e-63	1.415e-21	2.954e-65	6.260e-24
0.05	7.534e+12	1.297e-37	2.006e-20	3.455e-40	5.343e-23
0.06	1.999e+12	3.872e-27	3.819e-20	7.690e-30	7.585e-23
0.08	7.745e+12	2.371e-17	2.267e-15	3.752e-20	3.587e-18
0.1	8.428e+12	1.285e-13	2.859e-11	1.966e-16	4.374e-14
0.15	8.493e+12	6.587e-10	2.876e-07	1.085e-12	4.736e-10
0.2	6.050e+13	2.567e-07	1.251e-04	4.530e-10	2.208e-07
0.3	4.401e+13	2.045e-05	6.906e-03	3.879e-08	1.310e-05
0.4	2.208e+14	2.134e-03	4.527e-01	4.159e-06	8.821e-04
0.5	4.188e+14	3.803e-02	5.387e+00	7.464e-05	1.057e-02
0.6	2.411e+14	1.268e-01	1.273e+01	2.476e-04	2.485e-02
0.8	2.206e+14	1.646e+00	9.600e+01	3.131e-03	1.826e-01
1.0	1.548e+14	8.139e+00	3.147e+02	1.500e-02	5.800e-01
1.5	1.524e+14	2.112e+02	4.127e+03	3.554e-01	6.944e+00
2.0	2.774e+13	2.944e+02	3.834e+03	4.552e-01	5.928e+00
3.0	1.346e+11	1.638e+01	1.299e+02	2.223e-02	1.763e-01
4.0	2.002e+08	1.029e-01	6.021e-01	1.272e-04	7.448e-04
TOTALS:	1.642e+15	5.321e+02	8.521e+03	8.514e-01	1.385e+01

Results - Dose Point # 5 - (441.96,457.2,0) cm

DOS File: ASTCS8.MS5
Run Date: August 10, 2005
Run Time: 5:32:05 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.422e+08	0.000e+00	1.577e-26	0.000e+00	1.353e-27
0.02	6.742e+11	0.000e+00	4.889e-23	0.000e+00	1.694e-24
0.03	6.472e+13	3.758e-130	1.038e-20	3.724e-132	1.029e-22
0.04	1.738e+12	4.209e-63	7.392e-22	1.862e-65	3.269e-24
0.05	7.534e+12	8.228e-38	1.047e-20	2.192e-40	2.790e-23
0.06	1.999e+12	2.464e-27	1.994e-20	4.895e-30	3.961e-23
0.08	7.745e+12	1.515e-17	1.449e-15	2.398e-20	2.293e-18
0.1	8.428e+12	8.231e-14	1.833e-11	1.259e-16	2.804e-14
0.15	8.493e+12	4.232e-10	1.850e-07	6.970e-13	3.047e-10
0.2	6.050e+13	1.652e-07	8.067e-05	2.916e-10	1.424e-07
0.3	4.401e+13	1.320e-05	4.463e-03	2.503e-08	8.466e-06
0.4	2.208e+14	1.380e-03	2.930e-01	2.688e-06	5.709e-04
0.5	4.188e+14	2.461e-02	3.490e+00	4.831e-05	6.851e-03
0.6	2.411e+14	8.217e-02	8.255e+00	1.604e-04	1.611e-02
0.8	2.206e+14	1.068e+00	6.232e+01	2.031e-03	1.185e-01
1.0	1.548e+14	5.283e+00	2.044e+02	9.739e-03	3.768e-01
1.5	1.524e+14	1.373e+02	2.683e+03	2.310e-01	4.515e+00
2.0	2.774e+13	1.914e+02	2.492e+03	2.959e-01	3.854e+00
3.0	1.346e+11	1.064e+01	8.430e+01	1.444e-02	1.144e-01
4.0	2.002e+08	6.669e-02	3.896e-01	8.250e-05	4.820e-04
TOTALS:	1.642e+15	3.458e+02	5.539e+03	5.534e-01	9.002e+00

Results - Dose Point # 6 - (594.36,457.2,0) cm

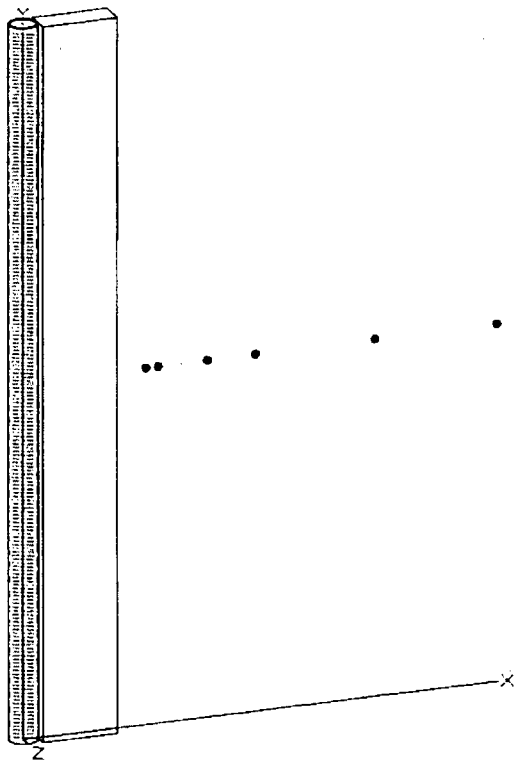
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.422e+08	0.000e+00	9.582e-27	0.000e+00	8.219e-28
0.02	6.742e+11	0.000e+00	2.971e-23	0.000e+00	1.029e-24
0.03	6.472e+13	2.634e-130	6.306e-21	2.611e-132	6.249e-23
0.04	1.738e+12	3.002e-63	4.491e-22	1.328e-65	1.986e-24
0.05	7.534e+12	5.906e-38	6.364e-21	1.573e-40	1.695e-23
0.06	1.999e+12	1.775e-27	1.212e-20	3.525e-30	2.407e-23
0.08	7.745e+12	1.095e-17	1.048e-15	1.733e-20	1.658e-18
0.1	8.428e+12	5.961e-14	1.329e-11	9.119e-17	2.033e-14
0.15	8.493e+12	3.075e-10	1.346e-07	5.063e-13	2.217e-10
0.2	6.050e+13	1.203e-07	5.882e-05	2.123e-10	1.038e-07
0.3	4.401e+13	9.632e-06	3.262e-03	1.827e-08	6.188e-06
0.4	2.208e+14	1.009e-03	2.145e-01	1.965e-06	4.179e-04
0.5	4.188e+14	1.801e-02	2.557e+00	3.536e-05	5.019e-03
0.6	2.411e+14	6.018e-02	6.050e+00	1.175e-04	1.181e-02
0.8	2.206e+14	7.825e-01	4.568e+01	1.488e-03	8.689e-02
1.0	1.548e+14	3.872e+00	1.497e+02	7.137e-03	2.760e-01
1.5	1.524e+14	1.004e+02	1.959e+03	1.689e-01	3.296e+00
2.0	2.774e+13	1.395e+02	1.811e+03	2.157e-01	2.801e+00
3.0	1.346e+11	7.703e+00	6.074e+01	1.045e-02	8.240e-02
4.0	2.002e+08	4.797e-02	2.786e-01	5.934e-05	3.447e-04
TOTALS:	1.642e+15	2.524e+02	4.036e+03	4.040e-01	6.560e+00

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

Page : 1
DOS File: ASTCS16.MS5
Date: August 10, 2005
Time: 4:49:51 PM
Duration: 00:03:24

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

Case Title: Control Room
Description: 14 inch core spray - Time = 16 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.0916e-003	4.0391e+007	1.3420e-003	4.9654e+001
Ba-137m	8.7417e+002	3.2344e+013	1.0747e+003	3.9762e+007
Ba-139	2.6721e-001	9.8870e+009	3.2850e-001	1.2155e+004
Ba-140	8.0791e+002	2.9893e+013	9.9320e+002	3.6748e+007
Ce-141	1.8994e+001	7.0277e+011	2.3350e+001	8.6395e+005
Ce-143	1.2747e+001	4.7162e+011	1.5670e+001	5.7979e+005
Ce-144	1.6131e+001	5.9683e+011	1.9830e+001	7.3371e+005
Cm-242	2.8365e-001	1.0495e+010	3.4870e-001	1.2902e+004
Cm-244	1.6667e-002	6.1669e+008	2.0490e-002	7.5813e+002
Co-58	3.1472e-001	1.1645e+010	3.8690e-001	1.4315e+004
Co-60	1.7042e-001	6.3054e+009	2.0950e-001	7.7515e+003
Cs-134	1.2275e+003	4.5417e+013	1.5090e+003	5.5833e+007
Cs-136	3.7849e+002	1.4004e+013	4.6530e+002	1.7216e+007
Cs-137	9.2407e+002	3.4190e+013	1.1360e+003	4.2032e+007

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	6.4790e+003	2.3972e+014	7.9650e+003	2.9470e+008
I-132	1.7123e+003	6.3355e+013	2.1050e+003	7.7885e+007
I-133	8.3540e+003	3.0910e+014	1.0270e+004	3.7999e+008
I-134	5.0384e-002	1.8642e+009	6.1940e-002	2.2918e+003
I-135	2.5249e+003	9.3422e+013	3.1040e+003	1.1485e+008
La-140	1.9197e+002	7.1030e+012	2.3600e+002	8.7320e+006
La-141	4.5219e-001	1.6731e+010	5.5590e-001	2.0568e+004
La-142	5.5948e-003	2.0701e+008	6.8780e-003	2.5449e+002
Mo-99	9.1268e+001	3.3769e+012	1.1220e+002	4.1514e+006
Nb-95	8.2076e+000	3.0368e+011	1.0090e+001	3.7333e+005
Nd-147	2.9747e+000	1.1007e+011	3.6570e+000	1.3531e+005
Np-239	1.8628e+002	6.8923e+012	2.2900e+002	8.4730e+006
Pr-143	7.1282e+000	2.6374e+011	8.7630e+000	3.2423e+005
Pr-144	1.5900e+001	5.8829e+011	1.9546e+001	7.2322e+005
Pu-238	4.8701e-002	1.8019e+009	5.9870e-002	2.2152e+003
Pu-239	5.1824e-003	1.9175e+008	6.3710e-003	2.3573e+002
Pu-240	8.3134e-003	3.0759e+008	1.0220e-002	3.7814e+002
Pu-241	2.0507e+000	7.5875e+010	2.5210e+000	9.3277e+004
Rb-86	1.1307e+001	4.1835e+011	1.3900e+001	5.1430e+005
Rh-103m	9.0703e+001	3.3560e+012	1.1151e+002	4.1257e+006
Rh-105	4.9229e+001	1.8215e+012	6.0520e+001	2.2392e+006
Rh-106	3.6580e+001	1.3535e+012	4.4970e+001	1.6639e+006
Ru-103	9.0943e+001	3.3649e+012	1.1180e+002	4.1366e+006
Ru-105	5.2288e+000	1.9347e+011	6.4280e+000	2.3784e+005
Ru-106	3.6580e+001	1.3535e+012	4.4970e+001	1.6639e+006
Sb-127	8.9072e+001	3.2957e+012	1.0950e+002	4.0515e+006
Sb-129	2.8479e+001	1.0537e+012	3.5010e+001	1.2954e+006
Sr-89	4.3552e+002	1.6114e+013	5.3540e+002	1.9810e+007
Sr-90	5.6022e+001	2.0728e+012	6.8870e+001	2.5482e+006
Sr-91	1.7432e+002	6.4498e+012	2.1430e+002	7.9291e+006
Sr-92	9.9321e+000	3.6749e+011	1.2210e+001	4.5177e+005
Tc-99m	8.8665e+001	3.2806e+012	1.0900e+002	4.0330e+006
Te-127	9.6067e+001	3.5545e+012	1.1810e+002	4.3697e+006
Te-127m	1.6976e+001	6.2813e+011	2.0870e+001	7.7219e+005
Te-129	9.6637e+001	3.5756e+012	1.1880e+002	4.3956e+006
Te-129m	7.0533e+001	2.6097e+012	8.6710e+001	3.2083e+006
Te-131m	1.5870e+002	5.8720e+012	1.9510e+002	7.2187e+006
Te-132	1.4284e+003	5.2851e+013	1.7560e+003	6.4972e+007
Y-90	8.8014e+000	3.2565e+011	1.0820e+001	4.0034e+005
Y-91	6.6385e+000	2.4562e+011	8.1610e+000	3.0196e+005
Y-92	4.7790e+001	1.7682e+012	5.8750e+001	2.1738e+006
Y-93	1.5236e+000	5.6372e+010	1.8730e+000	6.9301e+004
Zr-95	8.1425e+000	3.0127e+011	1.0010e+001	3.7037e+005
Zr-97	4.2120e+000	1.5584e+011	5.1780e+000	1.9159e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

DOS File: ASTCS16.MS5
Run Date: August 10, 2005
Run Time: 4:49:51 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.008e+08	0.000e+00	6.268e-26	0.000e+00	5.376e-27
0.02	6.417e+11	0.000e+00	2.104e-22	0.000e+00	7.289e-24
0.03	5.949e+13	1.081e-129	4.314e-20	1.071e-131	4.275e-22
0.04	1.660e+12	1.218e-62	3.193e-21	5.386e-65	1.412e-23
0.05	6.949e+12	2.309e-37	4.368e-20	6.152e-40	1.164e-22
0.06	1.927e+12	7.183e-27	8.696e-20	1.427e-29	1.727e-22
0.08	7.422e+12	4.336e-17	4.144e-15	6.862e-20	6.558e-18
0.1	7.583e+12	2.197e-13	4.885e-11	3.361e-16	7.474e-14
0.15	7.899e+12	1.159e-09	5.061e-07	1.909e-12	8.334e-10
0.2	5.343e+13	4.286e-07	2.089e-04	7.564e-10	3.688e-07
0.3	3.720e+13	3.267e-05	1.104e-02	6.197e-08	2.093e-05
0.4	2.051e+14	3.748e-03	7.953e-01	7.303e-06	1.550e-03
0.5	3.139e+14	5.391e-02	7.641e+00	1.058e-04	1.500e-02
0.6	1.912e+14	1.903e-01	1.910e+01	3.714e-04	3.729e-02
0.8	1.644e+14	2.322e+00	1.355e+02	4.417e-03	2.577e-01
1.0	8.581e+13	8.543e+00	3.304e+02	1.575e-02	6.090e-01
1.5	7.709e+13	2.024e+02	3.956e+03	3.406e-01	6.656e+00
2.0	1.269e+13	2.553e+02	3.326e+03	3.948e-01	5.144e+00
3.0	2.530e+11	5.843e+01	4.635e+02	7.927e-02	6.288e-01
4.0	5.434e+06	5.297e-03	3.102e-02	6.553e-06	3.837e-05
TOTALS:	1.235e+15	5.273e+02	8.239e+03	8.353e-01	1.335e+01

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.008e+08	0.000e+00	5.561e-26	0.000e+00	4.770e-27
0.02	6.417e+11	0.000e+00	1.867e-22	0.000e+00	6.467e-24
0.03	5.949e+13	9.674e-130	3.827e-20	9.588e-132	3.793e-22
0.04	1.660e+12	1.119e-62	2.833e-21	4.949e-65	1.253e-23
0.05	6.949e+12	2.105e-37	3.876e-20	5.607e-40	1.032e-22
0.06	1.927e+12	6.531e-27	7.715e-20	1.297e-29	1.532e-22
0.08	7.422e+12	3.949e-17	3.774e-15	6.249e-20	5.972e-18
0.1	7.583e+12	2.003e-13	4.454e-11	3.065e-16	6.815e-14
0.15	7.899e+12	1.058e-09	4.618e-07	1.742e-12	7.605e-10
0.2	5.343e+13	3.911e-07	1.907e-04	6.903e-10	3.365e-07
0.3	3.720e+13	2.981e-05	1.007e-02	5.654e-08	1.909e-05
0.4	2.051e+14	3.419e-03	7.252e-01	6.661e-06	1.413e-03
0.5	3.139e+14	4.916e-02	6.965e+00	9.649e-05	1.367e-02
0.6	1.912e+14	1.735e-01	1.741e+01	3.386e-04	3.398e-02
0.8	1.644e+14	2.117e+00	1.235e+02	4.026e-03	2.348e-01
1.0	8.581e+13	7.784e+00	3.010e+02	1.435e-02	5.548e-01
1.5	7.709e+13	1.843e+02	3.602e+03	3.102e-01	6.061e+00
2.0	1.269e+13	2.325e+02	3.028e+03	3.595e-01	4.682e+00
3.0	2.530e+11	5.318e+01	4.218e+02	7.216e-02	5.723e-01
4.0	5.434e+06	4.821e-03	2.823e-02	5.964e-06	3.492e-05
TOTALS:	1.235e+15	4.801e+02	7.502e+03	7.606e-01	1.215e+01

Results - Dose Point # 3 - (228.6,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.008e+08	0.000e+00	3.701e-26	0.000e+00	3.174e-27
0.02	6.417e+11	0.000e+00	1.242e-22	0.000e+00	4.303e-24
0.03	5.949e+13	7.153e-130	2.547e-20	7.089e-132	2.524e-22
0.04	1.660e+12	8.213e-63	1.885e-21	3.633e-65	8.337e-24
0.05	6.949e+12	1.531e-37	2.579e-20	4.078e-40	6.870e-23
0.06	1.927e+12	4.768e-27	5.134e-20	9.471e-30	1.020e-22
0.08	7.422e+12	2.897e-17	2.770e-15	4.585e-20	4.383e-18
0.1	7.583e+12	1.473e-13	3.275e-11	2.253e-16	5.010e-14
0.15	7.899e+12	7.791e-10	3.400e-07	1.283e-12	5.599e-10
0.2	5.343e+13	2.881e-07	1.404e-04	5.084e-10	2.478e-07
0.3	3.720e+13	2.195e-05	7.410e-03	4.163e-08	1.406e-05
0.4	2.051e+14	2.517e-03	5.337e-01	4.904e-06	1.040e-03
0.5	3.139e+14	3.618e-02	5.125e+00	7.102e-05	1.006e-02
0.6	1.912e+14	1.276e-01	1.281e+01	2.491e-04	2.500e-02
0.8	1.644e+14	1.557e+00	9.079e+01	2.961e-03	1.727e-01
1.0	8.581e+13	5.724e+00	2.213e+02	1.055e-02	4.079e-01
1.5	7.709e+13	1.355e+02	2.647e+03	2.279e-01	4.453e+00
2.0	1.269e+13	1.708e+02	2.224e+03	2.641e-01	3.439e+00
3.0	2.530e+11	3.906e+01	3.097e+02	5.299e-02	4.202e-01
4.0	5.434e+06	3.540e-03	2.072e-02	4.379e-06	2.563e-05
TOTALS:	1.235e+15	3.528e+02	5.511e+03	5.589e-01	8.929e+00

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.008e+08	0.000e+00	2.654e-26	0.000e+00	2.277e-27
0.02	6.417e+11	0.000e+00	8.911e-23	0.000e+00	3.087e-24
0.03	5.949e+13	5.604e-130	1.827e-20	5.554e-132	1.810e-22
0.04	1.660e+12	6.381e-63	1.352e-21	2.822e-65	5.980e-24
0.05	6.949e+12	1.196e-37	1.850e-20	3.187e-40	4.928e-23
0.06	1.927e+12	3.734e-27	3.682e-20	7.416e-30	7.314e-23
0.08	7.422e+12	2.272e-17	2.172e-15	3.596e-20	3.438e-18
0.1	7.583e+12	1.156e-13	2.572e-11	1.769e-16	3.935e-14
0.15	7.899e+12	6.126e-10	2.675e-07	1.009e-12	4.404e-10
0.2	5.343e+13	2.267e-07	1.105e-04	4.000e-10	1.950e-07
0.3	3.720e+13	1.728e-05	5.836e-03	3.278e-08	1.107e-05
0.4	2.051e+14	1.982e-03	4.205e-01	3.862e-06	8.193e-04
0.5	3.139e+14	2.850e-02	4.038e+00	5.595e-05	7.927e-03
0.6	1.912e+14	1.006e-01	1.009e+01	1.963e-04	1.970e-02
0.8	1.644e+14	1.227e+00	7.156e+01	2.334e-03	1.361e-01
1.0	8.581e+13	4.512e+00	1.744e+02	8.317e-03	3.215e-01
1.5	7.709e+13	1.068e+02	2.087e+03	1.797e-01	3.511e+00
2.0	1.269e+13	1.347e+02	1.754e+03	2.083e-01	2.712e+00
3.0	2.530e+11	3.081e+01	2.443e+02	4.179e-02	3.314e-01
4.0	5.434e+06	2.792e-03	1.634e-02	3.454e-06	2.022e-05
TOTALS:	1.235e+15	2.782e+02	4.346e+03	4.407e-01	7.041e+00

Results - Dose Point # 5 - (441.96,457.2,0) cm

DOS File: ASTCS16.MS5
Run Date: August 10, 2005
Run Time: 4:49:51 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.008e+08	0.000e+00	1.386e-26	0.000e+00	1.189e-27
0.02	6.417e+11	0.000e+00	4.654e-23	0.000e+00	1.612e-24
0.03	5.949e+13	3.454e-130	9.540e-21	3.423e-132	9.455e-23
0.04	1.660e+12	4.021e-63	7.061e-22	1.778e-65	3.123e-24
0.05	6.949e+12	7.589e-38	9.661e-21	2.022e-40	2.574e-23
0.06	1.927e+12	2.376e-27	1.923e-20	4.720e-30	3.820e-23
0.08	7.422e+12	1.452e-17	1.389e-15	2.298e-20	2.198e-18
0.1	7.583e+12	7.406e-14	1.649e-11	1.133e-16	2.523e-14
0.15	7.899e+12	3.936e-10	1.721e-07	6.482e-13	2.834e-10
0.2	5.343e+13	1.459e-07	7.125e-05	2.576e-10	1.257e-07
0.3	3.720e+13	1.115e-05	3.772e-03	2.116e-08	7.154e-06
0.4	2.051e+14	1.281e-03	2.721e-01	2.497e-06	5.303e-04
0.5	3.139e+14	1.845e-02	2.616e+00	3.621e-05	5.136e-03
0.6	1.912e+14	6.514e-02	6.545e+00	1.272e-04	1.277e-02
0.8	1.644e+14	7.959e-01	4.646e+01	1.514e-03	8.836e-02
1.0	8.581e+13	2.929e+00	1.133e+02	5.399e-03	2.089e-01
1.5	7.709e+13	6.943e+01	1.357e+03	1.168e-01	2.283e+00
2.0	1.269e+13	8.756e+01	1.140e+03	1.354e-01	1.763e+00
3.0	2.530e+11	2.001e+01	1.585e+02	2.715e-02	2.150e-01
4.0	5.434e+06	1.810e-03	1.058e-02	2.239e-06	1.308e-05
TOTALS:	1.235e+15	1.808e+02	2.825e+03	2.864e-01	4.577e+00

Results - Dose Point # 6 - (594.36,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.008e+08	0.000e+00	8.423e-27	0.000e+00	7.225e-28
0.02	6.417e+11	0.000e+00	2.828e-23	0.000e+00	9.794e-25
0.03	5.949e+13	2.421e-130	5.796e-21	2.400e-132	5.745e-23
0.04	1.660e+12	2.868e-63	4.290e-22	1.268e-65	1.898e-24
0.05	6.949e+12	5.448e-38	5.870e-21	1.451e-40	1.564e-23
0.06	1.927e+12	1.712e-27	1.169e-20	3.400e-30	2.321e-23
0.08	7.422e+12	1.049e-17	1.004e-15	1.661e-20	1.589e-18
0.1	7.583e+12	5.363e-14	1.196e-11	8.205e-17	1.829e-14
0.15	7.899e+12	2.860e-10	1.252e-07	4.709e-13	2.062e-10
0.2	5.343e+13	1.062e-07	5.195e-05	1.875e-10	9.168e-08
0.3	3.720e+13	8.140e-06	2.757e-03	1.544e-08	5.230e-06
0.4	2.051e+14	9.368e-04	1.992e-01	1.825e-06	3.881e-04
0.5	3.139e+14	1.350e-02	1.917e+00	2.650e-05	3.763e-03
0.6	1.912e+14	4.772e-02	4.797e+00	9.313e-05	9.363e-03
0.8	1.644e+14	5.833e-01	3.405e+01	1.109e-03	6.477e-02
1.0	8.581e+13	2.147e+00	8.301e+01	3.957e-03	1.530e-01
1.5	7.709e+13	5.078e+01	9.907e+02	8.544e-02	1.667e+00
2.0	1.269e+13	6.383e+01	8.287e+02	9.871e-02	1.282e+00
3.0	2.530e+11	1.448e+01	1.142e+02	1.965e-02	1.549e-01
4.0	5.434e+06	1.302e-03	7.562e-03	1.611e-06	9.356e-06
TOTALS:	1.235e+15	1.319e+02	2.058e+03	2.090e-01	3.335e+00

For Information Only

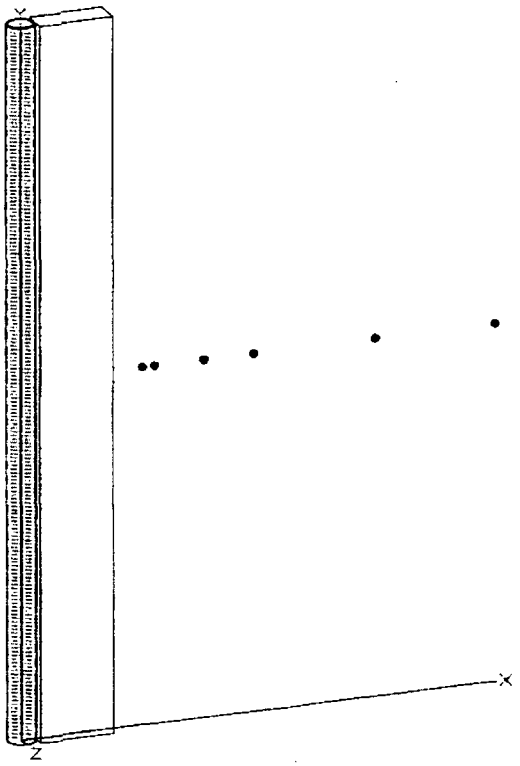
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
DOS File: ASTCS24.MS5
Date: August 10, 2005
Time: 4:59:19 PM
Duration: 00:03:24

EC-RADN-1129
Page 376

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

Case Title: Control Room
Description: 14 inch core spray - Time = 24 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.0843e-003	4.0120e+007	1.3330e-003	4.9321e+001
Ba-137m	8.6570e+002	3.2031e+013	1.0643e+003	3.9377e+007
Ba-139	4.7367e-003	1.7526e+008	5.8230e-003	2.1545e+002
Ba-140	7.8570e+002	2.9071e+013	9.6590e+002	3.5738e+007
Ce-141	1.8677e+001	6.9103e+011	2.2960e+001	8.4952e+005
Ce-143	1.0672e+001	3.9488e+011	1.3120e+001	4.8544e+005
Ce-144	1.5968e+001	5.9081e+011	1.9630e+001	7.2631e+005
Cm-242	2.8047e-001	1.0378e+010	3.4480e-001	1.2758e+004
Cm-244	1.6505e-002	6.1067e+008	2.0290e-002	7.5073e+002
Co-58	3.1065e-001	1.1494e+010	3.8190e-001	1.4130e+004
Co-60	1.6871e-001	6.2422e+009	2.0740e-001	7.6738e+003
Cs-134	1.2145e+003	4.4935e+013	1.4930e+003	5.5241e+007
Cs-136	3.6824e+002	1.3625e+013	4.5270e+002	1.6750e+007
Cs-137	9.1512e+002	3.3859e+013	1.1250e+003	4.1625e+007

DOS File: ASTCS24.MS5
Run Date: August 10, 2005
Run Time: 4:59:19 PM
Duration: 00:03:24

Nuclide	curies	becquerels	μCi/cm³	Bq/cm³
I-131	6.2383e+003	2.3082e+014	7.6690e+003	2.8375e+008
I-132	1.5740e+003	5.8238e+013	1.9350e+003	7.1595e+007
I-133	6.3399e+003	2.3458e+014	7.7940e+003	2.8838e+008
I-134	8.9316e-005	3.3047e+006	1.0980e-004	4.0626e+000
I-135	1.0811e+003	3.9999e+013	1.3290e+003	4.9173e+007
La-140	2.6852e+002	9.9351e+012	3.3010e+002	1.2214e+007
La-141	1.0924e-001	4.0421e+009	1.3430e-001	4.9691e+003
La-142	1.5187e-004	5.6192e+006	1.8670e-004	6.9079e+000
Mo-99	8.3052e+001	3.0729e+012	1.0210e+002	3.7777e+006
Nb-95	8.1230e+000	3.0055e+011	9.9860e+000	3.6948e+005
Nd-147	2.8845e+000	1.0672e+011	3.5460e+000	1.3120e+005
Np-239	1.6724e+002	6.1880e+012	2.0560e+002	7.6072e+006
Pr-143	7.1371e+000	2.6407e+011	8.7740e+000	3.2464e+005
Pr-144	1.5739e+001	5.8236e+011	1.9349e+001	7.1592e+005
Pu-238	4.8229e-002	1.7845e+009	5.9290e-002	2.1937e+003
Pu-239	5.1369e-003	1.9006e+008	6.3150e-003	2.3366e+002
Pu-240	8.2401e-003	3.0489e+008	1.0130e-002	3.7481e+002
Pu-241	2.0312e+000	7.5153e+010	2.4970e+000	9.2389e+004
Rb-86	1.1055e+001	4.0902e+011	1.3590e+001	5.0283e+005
Rh-103m	8.9324e+001	3.3050e+012	1.0981e+002	4.0630e+006
Rh-105	4.2104e+001	1.5578e+012	5.1760e+001	1.9151e+006
Rh-106	3.6206e+001	1.3396e+012	4.4510e+001	1.6469e+006
Ru-103	8.9560e+001	3.3137e+012	1.1010e+002	4.0737e+006
Ru-105	1.4853e+000	5.4958e+010	1.8260e+000	6.7562e+004
Ru-106	3.6206e+001	1.3396e+012	4.4510e+001	1.6469e+006
Sb-127	8.3052e+001	3.0729e+012	1.0210e+002	3.7777e+006
Sb-129	7.8131e+000	2.8908e+011	9.6050e+000	3.5539e+005
Sr-89	4.2933e+002	1.5885e+013	5.2780e+002	1.9529e+007
Sr-90	5.5477e+001	2.0526e+012	6.8200e+001	2.5234e+006
Sr-91	9.6311e+001	3.5635e+012	1.1840e+002	4.3808e+006
Sr-92	1.2706e+000	4.7012e+010	1.5620e+000	5.7794e+004
Tc-99m	8.3296e+001	3.0820e+012	1.0240e+002	3.7888e+006
Te-127	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Te-127m	1.6814e+001	6.2211e+011	2.0670e+001	7.6479e+005
Te-129	7.0981e+001	2.6263e+012	8.7260e+001	3.2286e+006
Te-129m	6.9395e+001	2.5676e+012	8.5310e+001	3.1565e+006
Te-131m	1.3064e+002	4.8336e+012	1.6060e+002	5.9422e+006
Te-132	1.3178e+003	4.8758e+013	1.6200e+003	5.9940e+007
Y-90	1.2625e+001	4.6711e+011	1.5520e+001	5.7424e+005
Y-91	6.7654e+000	2.5032e+011	8.3170e+000	3.0773e+005
Y-92	1.2706e+001	4.7012e+011	1.5620e+001	5.7794e+005
Y-93	8.7119e-001	3.2234e+010	1.0710e+000	3.9627e+004
Zr-95	8.0376e+000	2.9739e+011	9.8810e+000	3.6560e+005
Zr-97	3.0048e+000	1.1118e+011	3.6940e+000	1.3668e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

DOS File: ASTCS24.MS5
Run Date: August 10, 2005
Run Time: 4:59:19 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.758e+08	0.000e+00	5.748e-26	0.000e+00	4.930e-27
0.02	6.115e+11	0.000e+00	2.005e-22	0.000e+00	6.946e-24
0.03	5.530e+13	1.005e-129	4.010e-20	9.960e-132	3.974e-22
0.04	1.594e+12	1.169e-62	3.066e-21	5.172e-65	1.356e-23
0.05	6.412e+12	2.131e-37	4.030e-20	5.676e-40	1.074e-22
0.06	1.860e+12	6.932e-27	8.392e-20	1.377e-29	1.667e-22
0.08	7.119e+12	4.159e-17	3.975e-15	6.582e-20	6.290e-18
0.1	6.835e+12	1.980e-13	4.403e-11	3.030e-16	6.736e-14
0.15	7.535e+12	1.106e-09	4.828e-07	1.821e-12	7.951e-10
0.2	4.836e+13	3.878e-07	1.891e-04	6.845e-10	3.337e-07
0.3	3.396e+13	2.983e-05	1.008e-02	5.659e-08	1.911e-05
0.4	1.945e+14	3.554e-03	7.542e-01	6.925e-06	1.469e-03
0.5	2.432e+14	4.177e-02	5.919e+00	8.198e-05	1.162e-02
0.6	1.811e+14	1.802e-01	1.809e+01	3.517e-04	3.531e-02
0.8	1.473e+14	2.081e+00	1.214e+02	3.957e-03	2.309e-01
1.0	5.834e+13	5.808e+00	2.246e+02	1.071e-02	4.141e-01
1.5	4.764e+13	1.251e+02	2.445e+03	2.105e-01	4.114e+00
2.0	6.611e+12	1.330e+02	1.732e+03	2.056e-01	2.679e+00
3.0	3.538e+11	8.171e+01	6.482e+02	1.109e-01	8.794e-01
4.0	1.475e+05	1.438e-04	8.420e-04	1.779e-07	1.042e-06
TOTALS:	1.049e+15	3.479e+02	5.196e+03	5.421e-01	8.365e+00

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.758e+08	0.000e+00	5.100e-26	0.000e+00	4.374e-27
0.02	6.115e+11	0.000e+00	1.779e-22	0.000e+00	6.162e-24
0.03	5.530e+13	8.993e-130	3.558e-20	8.913e-132	3.526e-22
0.04	1.594e+12	1.074e-62	2.720e-21	4.752e-65	1.203e-23
0.05	6.412e+12	1.942e-37	3.576e-20	5.173e-40	9.526e-23
0.06	1.860e+12	6.303e-27	7.446e-20	1.252e-29	1.479e-22
0.08	7.119e+12	3.788e-17	3.620e-15	5.994e-20	5.729e-18
0.1	6.835e+12	1.806e-13	4.015e-11	2.763e-16	6.143e-14
0.15	7.535e+12	1.009e-09	4.406e-07	1.662e-12	7.255e-10
0.2	4.836e+13	3.539e-07	1.725e-04	6.247e-10	3.045e-07
0.3	3.396e+13	2.722e-05	9.191e-03	5.163e-08	1.743e-05
0.4	1.945e+14	3.242e-03	6.877e-01	6.316e-06	1.340e-03
0.5	2.432e+14	3.808e-02	5.396e+00	7.476e-05	1.059e-02
0.6	1.811e+14	1.643e-01	1.649e+01	3.207e-04	3.218e-02
0.8	1.473e+14	1.896e+00	1.106e+02	3.607e-03	2.104e-01
1.0	5.834e+13	5.292e+00	2.046e+02	9.755e-03	3.772e-01
1.5	4.764e+13	1.139e+02	2.226e+03	1.917e-01	3.746e+00
2.0	6.611e+12	1.211e+02	1.577e+03	1.872e-01	2.439e+00
3.0	3.538e+11	7.437e+01	5.899e+02	1.009e-01	8.003e-01
4.0	1.475e+05	1.309e-04	7.662e-04	1.619e-07	9.478e-07
TOTALS:	1.049e+15	3.168e+02	4.731e+03	4.936e-01	7.617e+00

Results - Dose Point # 3 - (228.6,457.2,0) cm

DOS File: ASTCS24.MS5
Run Date: August 10, 2005
Run Time: 4:59:19 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.758e+08	0.000e+00	3.393e-26	0.000e+00	2.911e-27
0.02	6.115e+11	0.000e+00	1.184e-22	0.000e+00	4.100e-24
0.03	5.530e+13	6.649e-130	2.367e-20	6.590e-132	2.346e-22
0.04	1.594e+12	7.886e-63	1.810e-21	3.488e-65	8.005e-24
0.05	6.412e+12	1.412e-37	2.379e-20	3.762e-40	6.339e-23
0.06	1.860e+12	4.602e-27	4.954e-20	9.140e-30	9.841e-23
0.08	7.119e+12	2.779e-17	2.657e-15	4.398e-20	4.204e-18
0.1	6.835e+12	1.327e-13	2.952e-11	2.031e-16	4.516e-14
0.15	7.535e+12	7.432e-10	3.243e-07	1.224e-12	5.341e-10
0.2	4.836e+13	2.607e-07	1.270e-04	4.601e-10	2.242e-07
0.3	3.396e+13	2.004e-05	6.766e-03	3.802e-08	1.283e-05
0.4	1.945e+14	2.387e-03	5.061e-01	4.650e-06	9.861e-04
0.5	2.432e+14	2.803e-02	3.970e+00	5.502e-05	7.793e-03
0.6	1.811e+14	1.209e-01	1.213e+01	2.359e-04	2.368e-02
0.8	1.473e+14	1.395e+00	8.133e+01	2.653e-03	1.547e-01
1.0	5.834e+13	3.891e+00	1.504e+02	7.173e-03	2.773e-01
1.5	4.764e+13	8.374e+01	1.636e+03	1.409e-01	2.752e+00
2.0	6.611e+12	8.895e+01	1.158e+03	1.376e-01	1.791e+00
3.0	3.538e+11	5.462e+01	4.331e+02	7.410e-02	5.876e-01
4.0	1.475e+05	9.608e-05	5.624e-04	1.189e-07	6.958e-07
TOTALS:	1.049e+15	2.327e+02	3.476e+03	3.627e-01	5.596e+00

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.758e+08	0.000e+00	2.434e-26	0.000e+00	2.088e-27
0.02	6.115e+11	0.000e+00	8.491e-23	0.000e+00	2.941e-24
0.03	5.530e+13	5.210e-130	1.698e-20	5.163e-132	1.683e-22
0.04	1.594e+12	6.127e-63	1.298e-21	2.710e-65	5.742e-24
0.05	6.412e+12	1.104e-37	1.707e-20	2.941e-40	4.547e-23
0.06	1.860e+12	3.603e-27	3.554e-20	7.157e-30	7.059e-23
0.08	7.119e+12	2.180e-17	2.084e-15	3.449e-20	3.298e-18
0.1	6.835e+12	1.042e-13	2.319e-11	1.595e-16	3.547e-14
0.15	7.535e+12	5.844e-10	2.551e-07	9.624e-13	4.202e-10
0.2	4.836e+13	2.051e-07	1.000e-04	3.620e-10	1.765e-07
0.3	3.396e+13	1.578e-05	5.329e-03	2.993e-08	1.011e-05
0.4	1.945e+14	1.880e-03	3.987e-01	3.663e-06	7.769e-04
0.5	2.432e+14	2.208e-02	3.129e+00	4.335e-05	6.141e-03
0.6	1.811e+14	9.525e-02	9.559e+00	1.859e-04	1.866e-02
0.8	1.473e+14	1.099e+00	6.411e+01	2.091e-03	1.219e-01
1.0	5.834e+13	3.068e+00	1.186e+02	5.654e-03	2.186e-01
1.5	4.764e+13	6.602e+01	1.290e+03	1.111e-01	2.170e+00
2.0	6.611e+12	7.015e+01	9.135e+02	1.085e-01	1.413e+00
3.0	3.538e+11	4.308e+01	3.416e+02	5.845e-02	4.635e-01
4.0	1.475e+05	7.578e-05	4.436e-04	9.375e-08	5.488e-07
TOTALS:	1.049e+15	1.835e+02	2.741e+03	2.860e-01	4.413e+00

Results - Dose Point # 5 - (441.96,457.2,0) cm

DOS File: ASTCS24.MS5
Run Date: August 10, 2005
Run Time: 4:59:19 PM
Duration: 00:03:24

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.758e+08	0.000e+00	1.271e-26	0.000e+00	1.090e-27
0.02	6.115e+11	0.000e+00	4.434e-23	0.000e+00	1.536e-24
0.03	5.530e+13	3.211e-130	8.868e-21	3.182e-132	8.789e-23
0.04	1.594e+12	3.861e-63	6.780e-22	1.708e-65	2.999e-24
0.05	6.412e+12	7.002e-38	8.914e-21	1.865e-40	2.375e-23
0.06	1.860e+12	2.293e-27	1.856e-20	4.555e-30	3.686e-23
0.08	7.119e+12	1.393e-17	1.332e-15	2.204e-20	2.108e-18
0.1	6.835e+12	6.675e-14	1.486e-11	1.021e-16	2.274e-14
0.15	7.535e+12	3.755e-10	1.642e-07	6.184e-13	2.703e-10
0.2	4.836e+13	1.321e-07	6.447e-05	2.331e-10	1.138e-07
0.3	3.396e+13	1.018e-05	3.444e-03	1.932e-08	6.533e-06
0.4	1.945e+14	1.215e-03	2.581e-01	2.368e-06	5.028e-04
0.5	2.432e+14	1.429e-02	2.027e+00	2.805e-05	3.979e-03
0.6	1.811e+14	6.170e-02	6.199e+00	1.204e-04	1.210e-02
0.8	1.473e+14	7.130e-01	4.162e+01	1.356e-03	7.916e-02
1.0	5.834e+13	1.991e+00	7.705e+01	3.671e-03	1.420e-01
1.5	4.764e+13	4.291e+01	8.387e+02	7.220e-02	1.411e+00
2.0	6.611e+12	4.560e+01	5.938e+02	7.052e-02	9.183e-01
3.0	3.538e+11	2.798e+01	2.217e+02	3.796e-02	3.007e-01
4.0	1.475e+05	4.914e-05	2.871e-04	6.079e-08	3.551e-07
TOTALS:	1.049e+15	1.193e+02	1.781e+03	1.859e-01	2.868e+00

Results - Dose Point # 6 - (594.36,457.2,0) cm

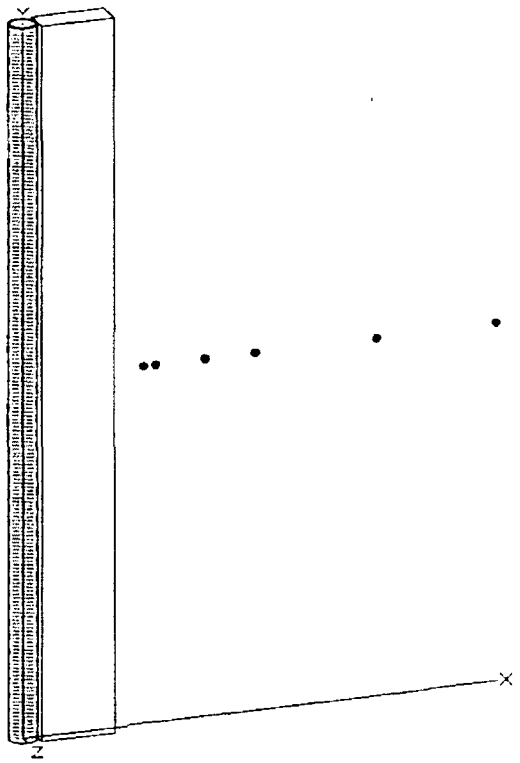
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.758e+08	0.000e+00	7.724e-27	0.000e+00	6.625e-28
0.02	6.115e+11	0.000e+00	2.694e-23	0.000e+00	9.333e-25
0.03	5.530e+13	2.251e-130	5.388e-21	2.231e-132	5.340e-23
0.04	1.594e+12	2.754e-63	4.120e-22	1.218e-65	1.822e-24
0.05	6.412e+12	5.026e-38	5.416e-21	1.339e-40	1.443e-23
0.06	1.860e+12	1.652e-27	1.128e-20	3.281e-30	2.240e-23
0.08	7.119e+12	1.007e-17	9.632e-16	1.593e-20	1.524e-18
0.1	6.835e+12	4.834e-14	1.078e-11	7.395e-17	1.649e-14
0.15	7.535e+12	2.728e-10	1.194e-07	4.492e-13	1.967e-10
0.2	4.836e+13	9.612e-08	4.701e-05	1.697e-10	8.297e-08
0.3	3.396e+13	7.433e-06	2.517e-03	1.410e-08	4.775e-06
0.4	1.945e+14	8.883e-04	1.889e-01	1.731e-06	3.681e-04
0.5	2.432e+14	1.046e-02	1.485e+00	2.053e-05	2.915e-03
0.6	1.811e+14	4.519e-02	4.543e+00	8.821e-05	8.868e-03
0.8	1.473e+14	5.226e-01	3.051e+01	9.939e-04	5.802e-02
1.0	5.834e+13	1.459e+00	5.644e+01	2.690e-03	1.040e-01
1.5	4.764e+13	3.138e+01	6.123e+02	5.280e-02	1.030e+00
2.0	6.611e+12	3.324e+01	4.316e+02	5.141e-02	6.675e-01
3.0	3.538e+11	2.025e+01	1.597e+02	2.748e-02	2.167e-01
4.0	1.475e+05	3.534e-05	2.053e-04	4.372e-08	2.540e-07
TOTALS:	1.049e+15	8.692e+01	1.297e+03	1.355e-01	2.089e+00

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

Page : 1
DOS File: ASTCS48.MS5
Run Date: August 30, 2005
Run Time: 4:25:12 PM
Duration: 00:03:25

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

Case Title: Control Room
Description: 14 inch core spray - Time = 48 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.0615e-003	3.9277e+007	1.3050e-003	4.8285e+001
Ba-137m	8.4108e+002	3.1120e+013	1.0340e+003	3.8257e+007
Ba-139	2.6372e-008	9.7575e+002	3.2420e-008	1.1995e-003
Ba-140	7.2274e+002	2.6741e+013	8.8850e+002	3.2875e+007
Ce-141	1.7757e+001	6.5702e+011	2.1830e+001	8.0771e+005
Ce-143	6.2610e+000	2.3166e+011	7.6970e+000	2.8479e+005
Ce-144	1.5472e+001	5.7245e+011	1.9020e+001	7.0374e+005
Cm-242	2.7128e-001	1.0037e+010	3.3350e-001	1.2339e+004
Cm-244	1.6033e-002	5.9322e+008	1.9710e-002	7.2927e+002
Co-58	2.9878e-001	1.1055e+010	3.6730e-001	1.3590e+004
Co-60	1.6383e-001	6.0616e+009	2.0140e-001	7.4518e+003
Cs-134	1.1787e+003	4.3611e+013	1.4490e+003	5.3613e+007
Cs-136	3.3920e+002	1.2551e+013	4.1700e+002	1.5429e+007
Cs-137	8.8909e+002	3.2896e+013	1.0930e+003	4.0441e+007

DOS File: ASTCS48.MS5
Run Date: August 30, 2005
Run Time: 4:25:12 PM
Duration: 00:03:25

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	5.5647e+003	2.0590e+014	6.8410e+003	2.5312e+008
I-132	1.2348e+003	4.5688e+013	1.5180e+003	5.6166e+007
I-133	2.7673e+003	1.0239e+014	3.4020e+003	1.2587e+008
I-134	4.9799e-013	1.8426e-002	6.1220e-013	2.2651e-008
I-135	8.4760e+001	3.1361e+012	1.0420e+002	3.8554e+006
La-140	4.2559e+002	1.5747e+013	5.2320e+002	1.9358e+007
La-141	1.5390e-003	5.6944e+007	1.8920e-003	7.0004e+001
La-142	3.0374e-009	1.1238e+002	3.7340e-009	1.3816e-004
Mo-99	6.2716e+001	2.3205e+012	7.7100e+001	2.8527e+006
Nb-95	7.8855e+000	2.9176e+011	9.6940e+000	3.5868e+005
Nd-147	2.6307e+000	9.7335e+010	3.2340e+000	1.1966e+005
Np-239	1.2104e+002	4.4785e+012	1.4880e+002	5.5056e+006
Pr-143	6.9915e+000	2.5869e+011	8.5950e+000	3.1802e+005
Pr-144	1.5250e+001	5.6426e+011	1.8748e+001	6.9368e+005
Pu-238	4.6846e-002	1.7333e+009	5.7590e-002	2.1308e+003
Pu-239	5.0002e-003	1.8501e+008	6.1470e-003	2.2744e+002
Pu-240	8.0002e-003	2.9601e+008	9.8350e-003	3.6390e+002
Pu-241	1.9726e+000	7.2986e+010	2.4250e+000	8.9725e+004
Rb-86	1.0347e+001	3.8284e+011	1.2720e+001	4.7064e+005
Rh-103m	8.5187e+001	3.1519e+012	1.0472e+002	3.8748e+006
Rh-105	2.5672e+001	9.4987e+011	3.1560e+001	1.1677e+006
Rh-106	3.5100e+001	1.2987e+012	4.3150e+001	1.5965e+006
Ru-103	8.5411e+001	3.1602e+012	1.0500e+002	3.8850e+006
Ru-105	3.4034e-002	1.2593e+009	4.1840e-002	1.5481e+003
Ru-106	3.5100e+001	1.2987e+012	4.3150e+001	1.5965e+006
Sb-127	6.7377e+001	2.4930e+012	8.2830e+001	3.0647e+006
Sb-129	1.6131e-001	5.9683e+009	1.9830e-001	7.3371e+003
Sr-89	4.1136e+002	1.5220e+013	5.0570e+002	1.8711e+007
Sr-90	5.3874e+001	1.9933e+012	6.6230e+001	2.4505e+006
Sr-91	1.6236e+001	6.0074e+011	1.9960e+001	7.3852e+005
Sr-92	2.6640e-003	9.8569e+007	3.2750e-003	1.2117e+002
Tc-99m	6.4180e+001	2.3747e+012	7.8900e+001	2.9193e+006
Te-127	7.9880e+001	2.9556e+012	9.8200e+001	3.6334e+006
Te-127m	1.6309e+001	6.0345e+011	2.0050e+001	7.4185e+005
Te-129	5.7323e+001	2.1210e+012	7.0470e+001	2.6074e+006
Te-129m	6.6035e+001	2.4433e+012	8.1180e+001	3.0037e+006
Te-131m	7.2876e+001	2.6964e+012	8.9590e+001	3.3148e+006
Te-132	1.0347e+003	3.8284e+013	1.2720e+003	4.7064e+007
Y-90	2.1857e+001	8.0871e+011	2.6870e+001	9.9419e+005
Y-91	6.7117e+000	2.4833e+011	8.2510e+000	3.0529e+005
Y-92	1.4325e-001	5.3001e+009	1.7610e-001	6.5157e+003
Y-93	1.6301e-001	6.0315e+009	2.0040e-001	7.4148e+003
Zr-95	7.7228e+000	2.8574e+011	9.4940e+000	3.5128e+005
Zr-97	1.0908e+000	4.0360e+010	1.3410e+000	4.9617e+004

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

DOS File: ASTCS48.MS5
Run Date: August 30, 2005
Run Time: 4:25:12 PM
Duration: 00:03:25

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.443e+08	0.000e+00	5.091e-26	0.000e+00	4.367e-27
0.02	5.204e+11	0.000e+00	1.706e-22	0.000e+00	5.911e-24
0.03	4.539e+13	8.248e-130	3.291e-20	8.175e-132	3.262e-22
0.04	1.434e+12	1.052e-62	2.758e-21	4.653e-65	1.220e-23
0.05	5.036e+12	1.674e-37	3.166e-20	4.458e-40	8.433e-23
0.06	1.680e+12	6.260e-27	7.578e-20	1.243e-29	1.505e-22
0.08	6.306e+12	3.684e-17	3.521e-15	5.830e-20	5.572e-18
0.1	5.032e+12	1.458e-13	3.242e-11	2.231e-16	4.960e-14
0.15	6.433e+12	9.443e-10	4.122e-07	1.555e-12	6.788e-10
0.2	3.750e+13	3.008e-07	1.466e-04	5.308e-10	2.588e-07
0.3	2.942e+13	2.584e-05	8.729e-03	4.902e-08	1.656e-05
0.4	1.712e+14	3.129e-03	6.639e-01	6.096e-06	1.294e-03
0.5	1.216e+14	2.088e-02	2.959e+00	4.099e-05	5.809e-03
0.6	1.579e+14	1.572e-01	1.578e+01	3.068e-04	3.080e-02
0.8	1.183e+14	1.670e+00	9.746e+01	3.177e-03	1.854e-01
1.0	3.376e+13	3.361e+00	1.300e+02	6.195e-03	2.396e-01
1.5	2.775e+13	7.286e+01	1.424e+03	1.226e-01	2.396e+00
2.0	2.097e+12	4.217e+01	5.494e+02	6.521e-02	8.495e-01
3.0	5.607e+11	1.295e+02	1.027e+03	1.757e-01	1.394e+00
4.0	2.950e+00	2.876e-09	1.684e-08	3.558e-12	2.083e-11
TOTALS:	7.719e+14	2.497e+02	3.247e+03	3.732e-01	5.102e+00

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.443e+08	0.000e+00	4.517e-26	0.000e+00	3.874e-27
0.02	5.204e+11	0.000e+00	1.514e-22	0.000e+00	5.244e-24
0.03	4.539e+13	7.381e-130	2.920e-20	7.315e-132	2.894e-22
0.04	1.434e+12	9.666e-63	2.447e-21	4.275e-65	1.082e-23
0.05	5.036e+12	1.525e-37	2.809e-20	4.063e-40	7.482e-23
0.06	1.680e+12	5.691e-27	6.723e-20	1.130e-29	1.335e-22
0.08	6.306e+12	3.355e-17	3.207e-15	5.309e-20	5.074e-18
0.1	5.032e+12	1.329e-13	2.956e-11	2.034e-16	4.522e-14
0.15	6.433e+12	8.618e-10	3.761e-07	1.419e-12	6.194e-10
0.2	3.750e+13	2.745e-07	1.338e-04	4.844e-10	2.361e-07
0.3	2.942e+13	2.358e-05	7.962e-03	4.473e-08	1.510e-05
0.4	1.712e+14	2.854e-03	6.053e-01	5.560e-06	1.179e-03
0.5	1.216e+14	1.904e-02	2.698e+00	3.737e-05	5.295e-03
0.6	1.579e+14	1.433e-01	1.438e+01	2.797e-04	2.807e-02
0.8	1.183e+14	1.522e+00	8.880e+01	2.896e-03	1.689e-01
1.0	3.376e+13	3.062e+00	1.184e+02	5.644e-03	2.183e-01
1.5	2.775e+13	6.635e+01	1.297e+03	1.116e-01	2.182e+00
2.0	2.097e+12	3.840e+01	5.001e+02	5.937e-02	7.734e-01
3.0	5.607e+11	1.179e+02	9.349e+02	1.599e-01	1.268e+00
4.0	2.950e+00	2.617e-09	1.532e-08	3.238e-12	1.896e-11
TOTALS:	7.719e+14	2.274e+02	2.957e+03	3.398e-01	4.645e+00

Results - Dose Point # 3 - (228.6,457.2,0) cm

DOS File: ASTCS48.MS5
Run Date: August 30, 2005
Run Time: 4:25:12 PM
Duration: 00:03:25

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.443e+08	0.000e+00	3.006e-26	0.000e+00	2.578e-27
0.02	5.204e+11	0.000e+00	1.007e-22	0.000e+00	3.490e-24
0.03	4.539e+13	5.457e-130	1.943e-20	5.408e-132	1.926e-22
0.04	1.434e+12	7.095e-63	1.628e-21	3.138e-65	7.202e-24
0.05	5.036e+12	1.109e-37	1.869e-20	2.955e-40	4.979e-23
0.06	1.680e+12	4.155e-27	4.474e-20	8.254e-30	8.886e-23
0.08	6.306e+12	2.462e-17	2.353e-15	3.896e-20	3.724e-18
0.1	5.032e+12	9.773e-14	2.173e-11	1.495e-16	3.325e-14
0.15	6.433e+12	6.345e-10	2.769e-07	1.045e-12	4.560e-10
0.2	3.750e+13	2.021e-07	9.852e-05	3.568e-10	1.739e-07
0.3	2.942e+13	1.736e-05	5.862e-03	3.294e-08	1.112e-05
0.4	1.712e+14	2.101e-03	4.455e-01	4.093e-06	8.681e-04
0.5	1.216e+14	1.401e-02	1.985e+00	2.751e-05	3.896e-03
0.6	1.579e+14	1.054e-01	1.058e+01	2.058e-04	2.065e-02
0.8	1.183e+14	1.120e+00	6.530e+01	2.130e-03	1.242e-01
1.0	3.376e+13	2.252e+00	8.704e+01	4.151e-03	1.604e-01
1.5	2.775e+13	4.877e+01	9.527e+02	8.205e-02	1.603e+00
2.0	2.097e+12	2.821e+01	3.673e+02	4.362e-02	5.681e-01
3.0	5.607e+11	8.657e+01	6.865e+02	1.175e-01	9.314e-01
4.0	2.950e+00	1.922e-09	1.125e-08	2.377e-12	1.392e-11
TOTALS:	7.719e+14	1.670e+02	2.172e+03	2.496e-01	3.412e+00

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.443e+08	0.000e+00	2.156e-26	0.000e+00	1.849e-27
0.02	5.204e+11	0.000e+00	7.226e-23	0.000e+00	2.503e-24
0.03	4.539e+13	4.276e-130	1.394e-20	4.238e-132	1.381e-22
0.04	1.434e+12	5.512e-63	1.168e-21	2.438e-65	5.166e-24
0.05	5.036e+12	8.670e-38	1.341e-20	2.310e-40	3.571e-23
0.06	1.680e+12	3.254e-27	3.209e-20	6.463e-30	6.374e-23
0.08	6.306e+12	1.931e-17	1.846e-15	3.055e-20	2.921e-18
0.1	5.032e+12	7.674e-14	1.707e-11	1.174e-16	2.612e-14
0.15	6.433e+12	4.989e-10	2.178e-07	8.216e-13	3.587e-10
0.2	3.750e+13	1.591e-07	7.755e-05	2.807e-10	1.369e-07
0.3	2.942e+13	1.367e-05	4.617e-03	2.593e-08	8.757e-06
0.4	1.712e+14	1.655e-03	3.510e-01	3.224e-06	6.839e-04
0.5	1.216e+14	1.104e-02	1.564e+00	2.167e-05	3.070e-03
0.6	1.579e+14	8.308e-02	8.338e+00	1.622e-04	1.627e-02
0.8	1.183e+14	8.825e-01	5.147e+01	1.679e-03	9.790e-02
1.0	3.376e+13	1.775e+00	6.862e+01	3.272e-03	1.265e-01
1.5	2.775e+13	3.845e+01	7.512e+02	6.469e-02	1.264e+00
2.0	2.097e+12	2.224e+01	2.897e+02	3.440e-02	4.480e-01
3.0	5.607e+11	6.828e+01	5.414e+02	9.263e-02	7.346e-01
4.0	2.950e+00	1.516e-09	8.872e-09	1.875e-12	1.098e-11
TOTALS:	7.719e+14	1.317e+02	1.713e+03	1.969e-01	2.691e+00

Results - Dose Point # 5 - (441.96,457.2,0) cm

DOS File: ASTCS48.MS5
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Run Time: 4:25:12 PM
Duration: 00:03:25

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.443e+08	0.000e+00	1.126e-26	0.000e+00	9.657e-28
0.02	5.204e+11	0.000e+00	3.774e-23	0.000e+00	1.307e-24
0.03	4.539e+13	2.635e-130	7.279e-21	2.612e-132	7.214e-23
0.04	1.434e+12	3.474e-63	6.100e-22	1.536e-65	2.698e-24
0.05	5.036e+12	5.499e-38	7.001e-21	1.465e-40	1.865e-23
0.06	1.680e+12	2.071e-27	1.676e-20	4.113e-30	3.329e-23
0.08	6.306e+12	1.234e-17	1.180e-15	1.952e-20	1.867e-18
0.1	5.032e+12	4.915e-14	1.094e-11	7.519e-17	1.674e-14
0.15	6.433e+12	3.206e-10	1.402e-07	5.279e-13	2.308e-10
0.2	3.750e+13	1.024e-07	5.000e-05	1.807e-10	8.824e-08
0.3	2.942e+13	8.823e-06	2.984e-03	1.674e-08	5.660e-06
0.4	1.712e+14	1.070e-03	2.272e-01	2.084e-06	4.426e-04
0.5	1.216e+14	7.145e-03	1.013e+00	1.402e-05	1.989e-03
0.6	1.579e+14	5.381e-02	5.406e+00	1.050e-04	1.055e-02
0.8	1.183e+14	5.724e-01	3.341e+01	1.089e-03	6.355e-02
1.0	3.376e+13	1.152e+00	4.458e+01	2.124e-03	8.218e-02
1.5	2.775e+13	2.499e+01	4.884e+02	4.205e-02	8.218e-01
2.0	2.097e+12	1.446e+01	1.883e+02	2.236e-02	2.912e-01
3.0	5.607e+11	4.435e+01	3.513e+02	6.017e-02	4.766e-01
4.0	2.950e+00	9.827e-10	5.741e-09	1.216e-12	7.103e-12
TOTALS:	7.719e+14	8.559e+01	1.113e+03	1.279e-01	1.748e+00

Results - Dose Point # 6 - (594.36,457.2,0) cm

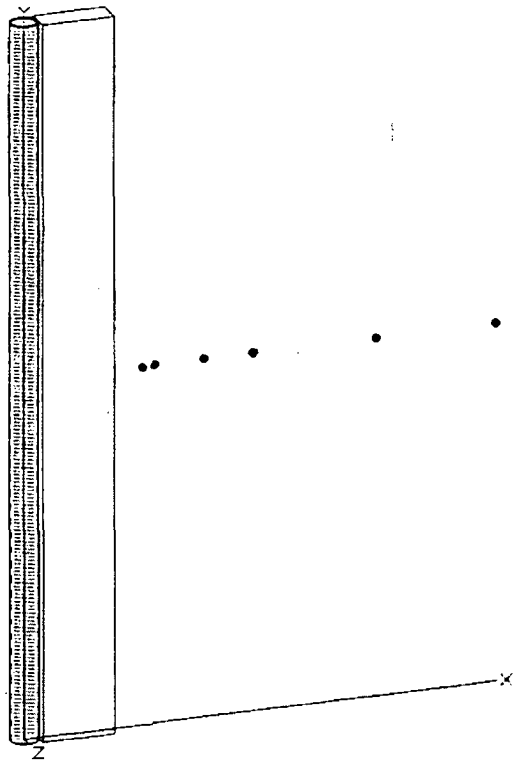
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.443e+08	0.000e+00	6.841e-27	0.000e+00	5.868e-28
0.02	5.204e+11	0.000e+00	2.293e-23	0.000e+00	7.943e-25
0.03	4.539e+13	1.847e-130	4.422e-21	1.831e-132	4.383e-23
0.04	1.434e+12	2.477e-63	3.706e-22	1.096e-65	1.639e-24
0.05	5.036e+12	3.948e-38	4.254e-21	1.052e-40	1.133e-23
0.06	1.680e+12	1.492e-27	1.018e-20	2.963e-30	2.023e-23
0.08	6.306e+12	8.916e-18	8.531e-16	1.411e-20	1.350e-18
0.1	5.032e+12	3.559e-14	7.934e-12	5.445e-17	1.214e-14
0.15	6.433e+12	2.329e-10	1.020e-07	3.835e-13	1.679e-10
0.2	3.750e+13	7.454e-08	3.645e-05	1.316e-10	6.434e-08
0.3	2.942e+13	6.440e-06	2.181e-03	1.222e-08	4.137e-06
0.4	1.712e+14	7.820e-04	1.663e-01	1.524e-06	3.240e-04
0.5	1.216e+14	5.229e-03	7.424e-01	1.026e-05	1.457e-03
0.6	1.579e+14	3.941e-02	3.963e+00	7.693e-05	7.734e-03
0.8	1.183e+14	4.195e-01	2.449e+01	7.980e-04	4.659e-02
1.0	3.376e+13	8.445e-01	3.266e+01	1.557e-03	6.020e-02
1.5	2.775e+13	1.828e+01	3.566e+02	3.075e-02	6.000e-01
2.0	2.097e+12	1.054e+01	1.369e+02	1.630e-02	2.117e-01
3.0	5.607e+11	3.210e+01	2.531e+02	4.355e-02	3.434e-01
4.0	2.950e+00	7.068e-10	4.106e-09	8.744e-13	5.079e-12
TOTALS:	7.719e+14	6.223e+01	8.086e+02	9.305e-02	1.271e+00

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

Page : 1
DOS File: ASTCS96.MS5
Date: August 10, 2005
Time: 5:23:02 PM
Duration: 00:03:17

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

Case Title: Control Room
Description: 14 inch core spray - Time = 96 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.0176e-003	3.7652e+007	1.2510e-003	4.6287e+001
Ba-137m	7.9337e+002	2.9355e+013	9.7533e+002	3.6087e+007
Ba-139				
Ba-140	6.1146e+002	2.2624e+013	7.5170e+002	2.7813e+007
Ce-141	1.6057e+001	5.9412e+011	1.9740e+001	7.3038e+005
Ce-143	2.1548e+000	7.9728e+010	2.6490e+000	9.8013e+004
Ce-144	1.4520e+001	5.3724e+011	1.7850e+001	6.6045e+005
Cm-242	2.5371e-001	9.3873e+009	3.1190e-001	1.1540e+004
Cm-244	1.5114e-002	5.5921e+008	1.8580e-002	6.8746e+002
Co-58	2.7633e-001	1.0224e+010	3.3970e-001	1.2569e+004
Co-60	1.5439e-001	5.7125e+009	1.8980e-001	7.0226e+003
Cs-134	1.1103e+003	4.1083e+013	1.3650e+003	5.0505e+007
Cs-136	2.8788e+002	1.0651e+013	3.5390e+002	1.3094e+007
Cs-137	8.3866e+002	3.1030e+013	1.0310e+003	3.8147e+007

DOS File: ASTCS96.MS5
Run Date: August 10, 2005
Run Time: 5:23:02 PM
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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	4.4227e+003	1.6364e+014	5.4370e+003	2.0117e+008
I-132	7.6130e+002	2.8168e+013	9.3590e+002	3.4628e+007
I-133	5.2727e+002	1.9509e+013	6.4820e+002	2.3983e+007
I-134				
I-135	5.2093e-001	1.9274e+010	6.4040e-001	2.3695e+004
La-140	5.3939e+002	1.9957e+013	6.6310e+002	2.4535e+007
La-141	3.0569e-007	1.1311e+004	3.7580e-007	1.3905e-002
La-142				
Mo-99	3.5734e+001	1.3222e+012	4.3930e+001	1.6254e+006
Nb-95	7.4275e+000	2.7482e+011	9.1310e+000	3.3785e+005
Nd-147	2.1865e+000	8.0901e+010	2.6880e+000	9.9456e+004
Np-239	6.3367e+001	2.3446e+012	7.7900e+001	2.8823e+006
Pr-143	6.3131e+000	2.3358e+011	7.7610e+000	2.8716e+005
Pr-144	1.4312e+001	5.2955e+011	1.7595e+001	6.5101e+005
Pu-238	4.4202e-002	1.6355e+009	5.4340e-002	2.0106e+003
Pu-239	4.7302e-003	1.7502e+008	5.8150e-003	2.1516e+002
Pu-240	7.5463e-003	2.7921e+008	9.2770e-003	3.4325e+002
Pu-241	1.8603e+000	6.8832e+010	2.2870e+000	8.4619e+004
Rb-86	9.0617e+000	3.3528e+011	1.1140e+001	4.1218e+005
Rh-103m	7.7585e+001	2.8706e+012	9.5378e+001	3.5290e+006
Rh-105	9.4522e+000	3.4973e+011	1.1620e+001	4.2994e+005
Rh-106	3.2985e+001	1.2204e+012	4.0550e+001	1.5004e+006
Ru-103	7.7789e+001	2.8782e+012	9.5630e+001	3.5383e+006
Ru-105	1.7871e-005	6.6124e+005	2.1970e-005	8.1289e-001
Ru-106	3.2985e+001	1.2204e+012	4.0550e+001	1.5004e+006
Sb-127	4.4341e+001	1.6406e+012	5.4510e+001	2.0169e+006
Sb-129	6.8809e-005	2.5459e+006	8.4590e-005	3.1298e+000
Sr-89	3.7752e+002	1.3968e+013	4.6410e+002	1.7172e+007
Sr-90	5.0816e+001	1.8802e+012	6.2470e+001	2.3114e+006
Sr-91	4.6146e-001	1.7074e+010	5.6730e-001	2.0990e+004
Sr-92	1.1705e-008	4.3310e+002	1.4390e-008	5.3243e-004
Tc-99m	3.6637e+001	1.3556e+012	4.5040e+001	1.6665e+006
Te-127	5.7551e+001	2.1294e+012	7.0750e+001	2.6178e+006
Te-127m	1.5309e+001	5.6643e+011	1.8820e+001	6.9634e+005
Te-129	5.1686e+001	1.9124e+012	6.3540e+001	2.3510e+006
Te-129m	5.9772e+001	2.2115e+012	7.3480e+001	2.7188e+006
Te-131m	2.2679e+001	8.3911e+011	2.7880e+001	1.0316e+006
Te-132	6.3782e+002	2.3599e+013	7.8410e+002	2.9012e+007
Y-90	3.2969e+001	1.2198e+012	4.0530e+001	1.4996e+006
Y-91	6.2244e+000	2.3030e+011	7.6520e+000	2.8312e+005
Y-92	1.1901e-005	4.4032e+005	1.4630e-005	5.4131e-001
Y-93	5.7047e-003	2.1107e+008	7.0130e-003	2.5948e+002
Zr-95	7.1290e+000	2.6377e+011	8.7640e+000	3.2427e+005
Zr-97	1.4365e-001	5.3152e+009	1.7660e-001	6.5342e+003

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

DOS File: ASTCS96.MS5
Run Date: August 10, 2005
Run Time: 5:23:02 PM
Duration: 00:03:17

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.250e+08	0.000e+00	4.690e-26	0.000e+00	4.022e-27
0.02	3.881e+11	0.000e+00	1.272e-22	0.000e+00	4.408e-24
0.03	3.185e+13	5.789e-130	2.310e-20	5.737e-132	2.289e-22
0.04	1.217e+12	8.925e-63	2.340e-21	3.947e-65	1.035e-23
0.05	3.107e+12	1.033e-37	1.953e-20	2.751e-40	5.204e-23
0.06	1.389e+12	5.177e-27	6.267e-20	1.028e-29	1.245e-22
0.08	4.999e+12	2.920e-17	2.791e-15	4.622e-20	4.417e-18
0.1	2.778e+12	8.048e-14	1.789e-11	1.231e-16	2.738e-14
0.15	4.792e+12	7.035e-10	3.071e-07	1.158e-12	5.057e-10
0.2	2.341e+13	1.878e-07	9.155e-05	3.314e-10	1.616e-07
0.3	2.419e+13	2.125e-05	7.177e-03	4.030e-08	1.361e-05
0.4	1.356e+14	2.478e-03	5.258e-01	4.829e-06	1.025e-03
0.5	4.369e+13	7.502e-03	1.063e+00	1.473e-05	2.087e-03
0.6	1.260e+14	1.254e-01	1.259e+01	2.448e-04	2.457e-02
0.8	8.907e+13	1.258e+00	7.341e+01	2.393e-03	1.396e-01
1.0	2.301e+13	2.291e+00	8.859e+01	4.222e-03	1.633e-01
1.5	2.519e+13	6.613e+01	1.293e+03	1.113e-01	2.175e+00
2.0	1.136e+12	2.286e+01	2.978e+02	3.534e-02	4.604e-01
3.0	7.106e+11	1.641e+02	1.302e+03	2.227e-01	1.766e+00
TOTALS:	5.425e+14	2.568e+02	3.068e+03	3.762e-01	4.732e+00

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.250e+08	0.000e+00	4.161e-26	0.000e+00	3.569e-27
0.02	3.881e+11	0.000e+00	1.129e-22	0.000e+00	3.911e-24
0.03	3.185e+13	5.180e-130	2.049e-20	5.134e-132	2.031e-22
0.04	1.217e+12	8.200e-63	2.076e-21	3.627e-65	9.182e-24
0.05	3.107e+12	9.411e-38	1.733e-20	2.507e-40	4.617e-23
0.06	1.389e+12	4.707e-27	5.560e-20	9.349e-30	1.104e-22
0.08	4.999e+12	2.660e-17	2.542e-15	4.209e-20	4.023e-18
0.1	2.778e+12	7.338e-14	1.632e-11	1.123e-16	2.496e-14
0.15	4.792e+12	6.420e-10	2.802e-07	1.057e-12	4.614e-10
0.2	2.341e+13	1.714e-07	8.354e-05	3.025e-10	1.474e-07
0.3	2.419e+13	1.938e-05	6.546e-03	3.677e-08	1.242e-05
0.4	1.356e+14	2.260e-03	4.795e-01	4.404e-06	9.342e-04
0.5	4.369e+13	6.841e-03	9.692e-01	1.343e-05	1.902e-03
0.6	1.260e+14	1.143e-01	1.147e+01	2.231e-04	2.240e-02
0.8	8.907e+13	1.147e+00	6.688e+01	2.181e-03	1.272e-01
1.0	2.301e+13	2.087e+00	8.070e+01	3.847e-03	1.488e-01
1.5	2.519e+13	6.023e+01	1.177e+03	1.013e-01	1.980e+00
2.0	1.136e+12	2.081e+01	2.711e+02	3.218e-02	4.192e-01
3.0	7.106e+11	1.494e+02	1.185e+03	2.027e-01	1.608e+00
TOTALS:	5.425e+14	2.338e+02	2.793e+03	3.425e-01	4.308e+00

Results - Dose Point # 3 - (228.6,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.250e+08	0.000e+00	2.769e-26	0.000e+00	2.375e-27

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.881e+11	0.000e+00	7.512e-23	0.000e+00	2.602e-24
0.03	3.185e+13	3.830e-130	1.364e-20	3.796e-132	1.351e-22
0.04	1.217e+12	6.019e-63	1.381e-21	2.662e-65	6.110e-24
0.05	3.107e+12	6.845e-38	1.153e-20	1.823e-40	3.072e-23
0.06	1.389e+12	3.437e-27	3.700e-20	6.826e-30	7.349e-23
0.08	4.999e+12	1.951e-17	1.865e-15	3.088e-20	2.952e-18
0.1	2.778e+12	5.394e-14	1.200e-11	8.253e-17	1.835e-14
0.15	4.792e+12	4.727e-10	2.063e-07	7.784e-13	3.397e-10
0.2	2.341e+13	1.262e-07	6.151e-05	2.228e-10	1.086e-07
0.3	2.419e+13	1.427e-05	4.819e-03	2.708e-08	9.142e-06
0.4	1.356e+14	1.664e-03	3.529e-01	3.242e-06	6.876e-04
0.5	4.369e+13	5.035e-03	7.131e-01	9.883e-06	1.400e-03
0.6	1.260e+14	8.412e-02	8.441e+00	1.642e-04	1.648e-02
0.8	8.907e+13	8.434e-01	4.918e+01	1.604e-03	9.355e-02
1.0	2.301e+13	1.535e+00	5.933e+01	2.829e-03	1.094e-01
1.5	2.519e+13	4.427e+01	8.648e+02	7.448e-02	1.455e+00
2.0	1.136e+12	1.529e+01	1.991e+02	2.364e-02	3.079e-01
3.0	7.106e+11	1.097e+02	8.700e+02	1.489e-01	1.180e+00
TOTALS:	5.425e+14	1.717e+02	2.052e+03	2.516e-01	3.165e+00

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.250e+08	0.000e+00	1.986e-26	0.000e+00	1.703e-27
0.02	3.881e+11	0.000e+00	5.389e-23	0.000e+00	1.867e-24
0.03	3.185e+13	3.001e-130	9.781e-21	2.974e-132	9.693e-23
0.04	1.217e+12	4.676e-63	9.909e-22	2.068e-65	4.382e-24
0.05	3.107e+12	5.350e-38	8.272e-21	1.425e-40	2.204e-23
0.06	1.389e+12	2.691e-27	2.654e-20	5.345e-30	5.272e-23
0.08	4.999e+12	1.531e-17	1.463e-15	2.422e-20	2.316e-18
0.1	2.778e+12	4.236e-14	9.423e-12	6.480e-17	1.442e-14
0.15	4.792e+12	3.717e-10	1.623e-07	6.121e-13	2.672e-10
0.2	2.341e+13	9.931e-08	4.842e-05	1.753e-10	8.546e-08
0.3	2.419e+13	1.124e-05	3.796e-03	2.132e-08	7.200e-06
0.4	1.356e+14	1.311e-03	2.780e-01	2.554e-06	5.417e-04
0.5	4.369e+13	3.966e-03	5.619e-01	7.786e-06	1.103e-03
0.6	1.260e+14	6.628e-02	6.652e+00	1.294e-04	1.298e-02
0.8	8.907e+13	6.647e-01	3.877e+01	1.264e-03	7.374e-02
1.0	2.301e+13	1.210e+00	4.677e+01	2.230e-03	8.621e-02
1.5	2.519e+13	3.490e+01	6.819e+02	5.872e-02	1.147e+00
2.0	1.136e+12	1.206e+01	1.570e+02	1.864e-02	2.428e-01
3.0	7.106e+11	8.654e+01	6.862e+02	1.174e-01	9.310e-01
TOTALS:	5.425e+14	1.354e+02	1.618e+03	1.984e-01	2.496e+00

Results - Dose Point # 5 - (441.96,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.250e+08	0.000e+00	1.037e-26	0.000e+00	8.896e-28

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	3.881e+11	0.000e+00	2.814e-23	0.000e+00	9.748e-25
0.03	3.185e+13	1.849e-130	5.108e-21	1.833e-132	5.062e-23
0.04	1.217e+12	2.947e-63	5.175e-22	1.303e-65	2.289e-24
0.05	3.107e+12	3.393e-38	4.320e-21	9.040e-41	1.151e-23
0.06	1.389e+12	1.713e-27	1.386e-20	3.402e-30	2.753e-23
0.08	4.999e+12	9.780e-18	9.354e-16	1.548e-20	1.480e-18
0.1	2.778e+12	2.713e-14	6.041e-12	4.150e-17	9.242e-15
0.15	4.792e+12	2.388e-10	1.044e-07	3.933e-13	1.719e-10
0.2	2.341e+13	6.394e-08	3.122e-05	1.128e-10	5.510e-08
0.3	2.419e+13	7.254e-06	2.453e-03	1.376e-08	4.653e-06
0.4	1.356e+14	8.472e-04	1.799e-01	1.651e-06	3.506e-04
0.5	4.369e+13	2.567e-03	3.641e-01	5.039e-06	7.147e-04
0.6	1.260e+14	4.294e-02	4.314e+00	8.381e-05	8.420e-03
0.8	8.907e+13	4.311e-01	2.517e+01	8.201e-04	4.787e-02
1.0	2.301e+13	7.853e-01	3.038e+01	1.448e-03	5.601e-02
1.5	2.519e+13	2.268e+01	4.433e+02	3.817e-02	7.459e-01
2.0	1.136e+12	7.838e+00	1.021e+02	1.212e-02	1.578e-01
3.0	7.106e+11	5.621e+01	4.452e+02	7.626e-02	6.041e-01
TOTALS:	5.425e+14	8.799e+01	1.051e+03	1.289e-01	1.621e+00

Results - Dose Point # 6 - (594.36,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.250e+08	0.000e+00	6.302e-27	0.000e+00	5.405e-28
0.02	3.881e+11	0.000e+00	1.710e-23	0.000e+00	5.923e-25
0.03	3.185e+13	1.296e-130	3.104e-21	1.285e-132	3.076e-23
0.04	1.217e+12	2.102e-63	3.144e-22	9.296e-66	1.391e-24
0.05	3.107e+12	2.436e-38	2.625e-21	6.489e-41	6.992e-24
0.06	1.389e+12	1.234e-27	8.422e-21	2.450e-30	1.673e-23
0.08	4.999e+12	7.068e-18	6.763e-16	1.118e-20	1.070e-18
0.1	2.778e+12	1.964e-14	4.380e-12	3.005e-17	6.700e-15
0.15	4.792e+12	1.735e-10	7.596e-08	2.857e-13	1.251e-10
0.2	2.341e+13	4.654e-08	2.276e-05	8.214e-11	4.017e-08
0.3	2.419e+13	5.294e-06	1.793e-03	1.004e-08	3.401e-06
0.4	1.356e+14	6.194e-04	1.317e-01	1.207e-06	2.566e-04
0.5	4.369e+13	1.879e-03	2.667e-01	3.688e-06	5.236e-04
0.6	1.260e+14	3.145e-02	3.162e+00	6.138e-05	6.171e-03
0.8	8.907e+13	3.160e-01	1.845e+01	6.010e-04	3.509e-02
1.0	2.301e+13	5.755e-01	2.226e+01	1.061e-03	4.103e-02
1.5	2.519e+13	1.659e+01	3.237e+02	2.791e-02	5.446e-01
2.0	1.136e+12	5.714e+00	7.419e+01	8.836e-03	1.147e-01
3.0	7.106e+11	4.069e+01	3.208e+02	5.520e-02	4.352e-01
TOTALS:	5.425e+14	6.392e+01	7.629e+02	9.368e-02	1.178e+00

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

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Duration: 00:03:16

EC-RADN-1129
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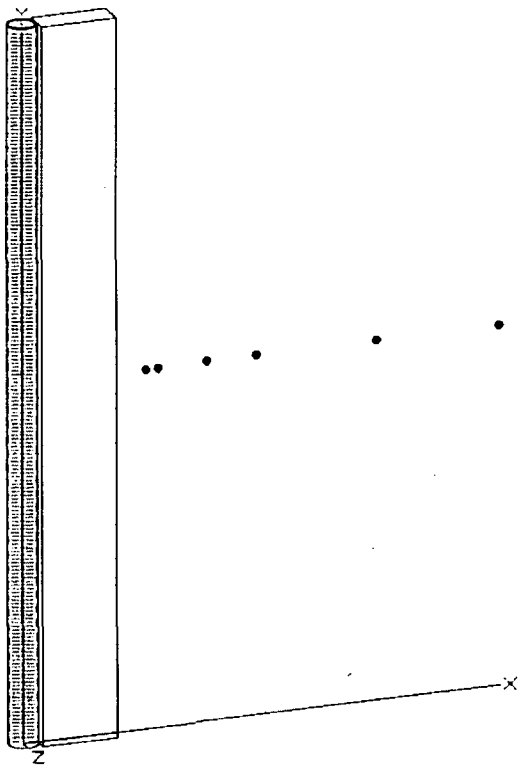
File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 14 inch core spray - Time = 240 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	8.9560e-004	3.3137e+007	1.1010e-003	4.0737e+001
Ba-137m	6.6548e+002	2.4623e+013	8.1810e+002	3.0270e+007
Ba-139				
Ba-140	3.7036e+002	1.3703e+013	4.5530e+002	1.6846e+007
Ce-141	1.1860e+001	4.3882e+011	1.4580e+001	5.3946e+005
Ce-143	8.7851e-002	3.2505e+009	1.0800e-001	3.9960e+003
Ce-144	1.2015e+001	4.4454e+011	1.4770e+001	5.4649e+005
Cm-242	2.0759e-001	7.6808e+009	2.5520e-001	9.4424e+003
Cm-244	1.2682e-002	4.6922e+008	1.5590e-002	5.7683e+002
Co-58	2.1873e-001	8.0932e+009	2.6890e-001	9.9493e+003
Co-60	1.2934e-001	4.7855e+009	1.5900e-001	5.8830e+003
Cs-134	9.2651e+002	3.4281e+013	1.1390e+003	4.2143e+007
Cs-136	1.7595e+002	6.5100e+012	2.1630e+002	8.0031e+006
Cs-137	7.0346e+002	2.6028e+013	8.6480e+002	3.1998e+007

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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	2.2150e+003	8.1955e+013	2.7230e+003	1.0075e+008
I-132	1.7831e+002	6.5973e+012	2.1920e+002	8.1104e+006
I-133	3.6475e+000	1.3496e+011	4.4840e+000	1.6591e+005
I-134				
I-135	1.2096e-007	4.4755e+003	1.4870e-007	5.5019e-003
La-140	4.1811e+002	1.5470e+013	5.1400e+002	1.9018e+007
La-141				
La-142				
Mo-99	6.6116e+000	2.4463e+011	8.1280e+000	3.0074e+005
Nb-95	6.1789e+000	2.2862e+011	7.5960e+000	2.8105e+005
Nd-147	1.2568e+000	4.6500e+010	1.5450e+000	5.7165e+004
Np-239	9.0943e+000	3.3649e+011	1.1180e+001	4.1366e+005
Pr-143	4.0404e+000	1.4949e+011	4.9670e+000	1.8378e+005
Pr-144	1.1843e+001	4.3818e+011	1.4559e+001	5.3868e+005
Pu-238	3.7125e-002	1.3736e+009	4.5640e-002	1.6887e+003
Pu-239	3.9826e-003	1.4736e+008	4.8960e-003	1.8115e+002
Pu-240	6.3351e-003	2.3440e+008	7.7880e-003	2.8816e+002
Pu-241	1.5602e+000	5.7727e+010	1.9180e+000	7.0966e+004
Rb-86	6.0886e+000	2.2528e+011	7.4850e+000	2.7694e+005
Rh-103m	5.8584e+001	2.1676e+012	7.2020e+001	2.6647e+006
Rh-105	4.7171e-001	1.7453e+010	5.7990e-001	2.1456e+004
Rh-106	2.7380e+001	1.0131e+012	3.3660e+001	1.2454e+006
Ru-103	5.8738e+001	2.1733e+012	7.2210e+001	2.6718e+006
Ru-105	2.5884e-015	9.5769e-005	3.1820e-015	1.1773e-010
Ru-106	2.7380e+001	1.0131e+012	3.3660e+001	1.2454e+006
Sb-127	1.2633e+001	4.6741e+011	1.5530e+001	5.7461e+005
Sb-129	5.3370e-015	1.9747e-004	6.5610e-015	2.4276e-010
Sr-89	2.9186e+002	1.0799e+013	3.5880e+002	1.3276e+007
Sr-90	4.2641e+001	1.5777e+012	5.2420e+001	1.9395e+006
Sr-91	1.0599e-005	3.9217e+005	1.3030e-005	4.8211e-001
Sr-92				
Tc-99m	6.7784e+000	2.5080e+011	8.3330e+000	3.0832e+005
Te-127	2.4737e+001	9.1526e+011	3.0410e+001	1.1252e+006
Te-127m	1.2527e+001	4.6350e+011	1.5400e+001	5.6980e+005
Te-129	3.8337e+001	1.4185e+012	4.7130e+001	1.7438e+006
Te-129m	4.4332e+001	1.6403e+012	5.4500e+001	2.0165e+006
Te-131m	6.8329e-001	2.5282e+010	8.4000e-001	3.1080e+004
Te-132	1.4943e+002	5.5289e+012	1.8370e+002	6.7969e+006
Y-90	3.9688e+001	1.4684e+012	4.8790e+001	1.8052e+006
Y-91	4.8676e+000	1.8010e+011	5.9840e+000	2.2141e+005
Y-92				
Y-93	2.4452e-007	9.0472e+003	3.0060e-007	1.1122e-002
Zr-95	5.6079e+000	2.0749e+011	6.8940e+000	2.5508e+005
Zr-97	3.2830e-004	1.2147e+007	4.0360e-004	1.4933e+001

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

DOS File: ASTCS240.MS5
Run Date: August 10, 2005
Run Time: 5:02:43 PM
Duration: 00:03:16

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.870e+08	0.000e+00	3.898e-26	0.000e+00	3.343e-27
0.02	2.118e+11	0.000e+00	6.944e-23	0.000e+00	2.406e-24
0.03	1.327e+13	2.412e-130	9.624e-21	2.390e-132	9.538e-23
0.04	8.490e+11	6.226e-63	1.632e-21	2.754e-65	7.220e-24
0.05	7.334e+11	2.437e-38	4.610e-21	6.493e-41	1.228e-23
0.06	8.245e+11	3.073e-27	3.720e-20	6.103e-30	7.389e-23
0.08	2.563e+12	1.498e-17	1.431e-15	2.370e-20	2.265e-18
0.1	5.357e+11	1.552e-14	3.451e-12	2.375e-17	5.280e-15
0.15	2.396e+12	3.517e-10	1.535e-07	5.792e-13	2.528e-10
0.2	6.151e+12	4.933e-08	2.405e-05	8.707e-11	4.245e-08
0.3	1.356e+13	1.191e-05	4.024e-03	2.260e-08	7.633e-06
0.4	6.791e+13	1.241e-03	2.634e-01	2.418e-06	5.132e-04
0.5	1.551e+13	2.664e-03	3.776e-01	5.229e-06	7.411e-04
0.6	7.887e+13	7.849e-02	7.880e+00	1.532e-04	1.538e-02
0.8	5.232e+13	7.391e-01	4.312e+01	1.406e-03	8.202e-02
1.0	1.112e+13	1.107e+00	4.282e+01	2.041e-03	7.892e-02
1.5	1.685e+13	4.425e+01	8.648e+02	7.445e-02	1.455e+00
2.0	3.529e+11	7.098e+00	9.247e+01	1.098e-02	1.430e-01
3.0	5.509e+11	1.272e+02	1.009e+03	1.726e-01	1.369e+00
TOTALS:	2.846e+14	1.805e+02	2.061e+03	2.616e-01	3.145e+00

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.870e+08	0.000e+00	3.458e-26	0.000e+00	2.966e-27
0.02	2.118e+11	0.000e+00	6.161e-23	0.000e+00	2.134e-24
0.03	1.327e+13	2.158e-130	8.538e-21	2.139e-132	8.462e-23
0.04	8.490e+11	5.721e-63	1.448e-21	2.530e-65	6.406e-24
0.05	7.334e+11	2.221e-38	4.090e-21	5.917e-41	1.090e-23
0.06	8.245e+11	2.794e-27	3.300e-20	5.549e-30	6.555e-23
0.08	2.563e+12	1.364e-17	1.303e-15	2.158e-20	2.063e-18
0.1	5.357e+11	1.415e-14	3.147e-12	2.165e-17	4.815e-15
0.15	2.396e+12	3.210e-10	1.401e-07	5.286e-13	2.307e-10
0.2	6.151e+12	4.502e-08	2.194e-05	7.946e-11	3.873e-08
0.3	1.356e+13	1.087e-05	3.670e-03	2.062e-08	6.962e-06
0.4	6.791e+13	1.132e-03	2.401e-01	2.206e-06	4.679e-04
0.5	1.551e+13	2.429e-03	3.442e-01	4.768e-06	6.756e-04
0.6	7.887e+13	7.155e-02	7.182e+00	1.397e-04	1.402e-02
0.8	5.232e+13	6.736e-01	3.929e+01	1.281e-03	7.473e-02
1.0	1.112e+13	1.009e+00	3.900e+01	1.859e-03	7.189e-02
1.5	1.685e+13	4.030e+01	7.875e+02	6.780e-02	1.325e+00
2.0	3.529e+11	6.462e+00	8.418e+01	9.993e-03	1.302e-01
3.0	5.509e+11	1.158e+02	9.185e+02	1.571e-01	1.246e+00
TOTALS:	2.846e+14	1.643e+02	1.876e+03	2.382e-01	2.863e+00

Results - Dose Point # 3 - (228.6,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.870e+08	0.000e+00	2.301e-26	0.000e+00	1.974e-27

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.118e+11	0.000e+00	4.100e-23	0.000e+00	1.420e-24
0.03	1.327e+13	1.596e-130	5.682e-21	1.582e-132	5.631e-23
0.04	8.490e+11	4.199e-63	9.638e-22	1.857e-65	4.262e-24
0.05	7.334e+11	1.615e-38	2.722e-21	4.303e-41	7.250e-24
0.06	8.245e+11	2.040e-27	2.196e-20	4.052e-30	4.362e-23
0.08	2.563e+12	1.001e-17	9.565e-16	1.583e-20	1.514e-18
0.1	5.357e+11	1.040e-14	2.314e-12	1.592e-17	3.540e-15
0.15	2.396e+12	2.363e-10	1.031e-07	3.892e-13	1.699e-10
0.2	6.151e+12	3.316e-08	1.616e-05	5.852e-11	2.852e-08
0.3	1.356e+13	8.003e-06	2.702e-03	1.518e-08	5.125e-06
0.4	6.791e+13	8.334e-04	1.767e-01	1.624e-06	3.444e-04
0.5	1.551e+13	1.788e-03	2.533e-01	3.510e-06	4.971e-04
0.6	7.887e+13	5.265e-02	5.283e+00	1.028e-04	1.031e-02
0.8	5.232e+13	4.954e-01	2.889e+01	9.424e-04	5.495e-02
1.0	1.112e+13	7.417e-01	2.867e+01	1.367e-03	5.285e-02
1.5	1.685e+13	2.962e+01	5.786e+02	4.983e-02	9.735e-01
2.0	3.529e+11	4.748e+00	6.183e+01	7.342e-03	9.561e-02
3.0	5.509e+11	8.505e+01	6.744e+02	1.154e-01	9.150e-01
TOTALS:	2.846e+14	1.207e+02	1.378e+03	1.750e-01	2.103e+00

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.870e+08	0.000e+00	1.651e-26	0.000e+00	1.416e-27
0.02	2.118e+11	0.000e+00	2.941e-23	0.000e+00	1.019e-24
0.03	1.327e+13	1.250e-130	4.075e-21	1.239e-132	4.039e-23
0.04	8.490e+11	3.263e-63	6.913e-22	1.443e-65	3.057e-24
0.05	7.334e+11	1.263e-38	1.952e-21	3.364e-41	5.201e-24
0.06	8.245e+11	1.597e-27	1.575e-20	3.172e-30	3.129e-23
0.08	2.563e+12	7.848e-18	7.503e-16	1.242e-20	1.187e-18
0.1	5.357e+11	8.170e-15	1.817e-12	1.250e-17	2.780e-15
0.15	2.396e+12	1.858e-10	8.114e-08	3.060e-13	1.336e-10
0.2	6.151e+12	2.609e-08	1.272e-05	4.605e-11	2.245e-08
0.3	1.356e+13	6.302e-06	2.128e-03	1.195e-08	4.037e-06
0.4	6.791e+13	6.564e-04	1.392e-01	1.279e-06	2.713e-04
0.5	1.551e+13	1.409e-03	1.996e-01	2.765e-06	3.917e-04
0.6	7.887e+13	4.149e-02	4.164e+00	8.098e-05	8.127e-03
0.8	5.232e+13	3.905e-01	2.277e+01	7.427e-04	4.332e-02
1.0	1.112e+13	5.846e-01	2.260e+01	1.078e-03	4.167e-02
1.5	1.685e+13	2.335e+01	4.562e+02	3.929e-02	7.676e-01
2.0	3.529e+11	3.744e+00	4.876e+01	5.790e-03	7.540e-02
3.0	5.509e+11	6.708e+01	5.319e+02	9.101e-02	7.217e-01
TOTALS:	2.846e+14	9.519e+01	1.087e+03	1.380e-01	1.658e+00

Results - Dose Point # 5 - (441.96,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.870e+08	0.000e+00	8.620e-27	0.000e+00	7.394e-28

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Run Time: 5:02:43 PM
Duration: 00:03:16

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	2.118e+11	0.000e+00	1.536e-23	0.000e+00	5.320e-25
0.03	1.327e+13	7.706e-131	2.128e-21	7.637e-133	2.109e-23
0.04	8.490e+11	2.056e-63	3.610e-22	9.093e-66	1.597e-24
0.05	7.334e+11	8.009e-39	1.020e-21	2.133e-41	2.716e-24
0.06	8.245e+11	1.017e-27	8.227e-21	2.019e-30	1.634e-23
0.08	2.563e+12	5.015e-18	4.796e-16	7.936e-21	7.590e-19
0.1	5.357e+11	5.232e-15	1.165e-12	8.005e-18	1.783e-15
0.15	2.396e+12	1.194e-10	5.221e-08	1.966e-13	8.597e-11
0.2	6.151e+12	1.680e-08	8.201e-06	2.965e-11	1.447e-08
0.3	1.356e+13	4.067e-06	1.375e-03	7.715e-09	2.609e-06
0.4	6.791e+13	4.243e-04	9.012e-02	8.268e-07	1.756e-04
0.5	1.551e+13	9.116e-04	1.293e-01	1.789e-06	2.538e-04
0.6	7.887e+13	2.687e-02	2.700e+00	5.246e-05	5.270e-03
0.8	5.232e+13	2.533e-01	1.478e+01	4.817e-04	2.812e-02
1.0	1.112e+13	3.795e-01	1.468e+01	6.996e-04	2.707e-02
1.5	1.685e+13	1.518e+01	2.966e+02	2.554e-02	4.991e-01
2.0	3.529e+11	2.434e+00	3.170e+01	3.764e-03	4.901e-02
3.0	5.509e+11	4.357e+01	3.451e+02	5.911e-02	4.682e-01
TOTALS:	2.846e+14	6.184e+01	7.058e+02	8.965e-02	1.077e+00

Results - Dose Point # 6 - (594.36,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.870e+08	0.000e+00	5.238e-27	0.000e+00	4.493e-28
0.02	2.118e+11	0.000e+00	9.332e-24	0.000e+00	3.232e-25
0.03	1.327e+13	5.402e-131	1.293e-21	5.354e-133	1.282e-23
0.04	8.490e+11	1.466e-63	2.194e-22	6.485e-66	9.702e-25
0.05	7.334e+11	5.749e-39	6.195e-22	1.532e-41	1.650e-24
0.06	8.245e+11	7.322e-28	4.999e-21	1.454e-30	9.928e-24
0.08	2.563e+12	3.624e-18	3.468e-16	5.735e-21	5.488e-19
0.1	5.357e+11	3.789e-15	8.447e-13	5.797e-18	1.292e-15
0.15	2.396e+12	8.675e-11	3.798e-08	1.428e-13	6.255e-11
0.2	6.151e+12	1.223e-08	5.979e-06	2.158e-11	1.055e-08
0.3	1.356e+13	2.968e-06	1.005e-03	5.631e-09	1.907e-06
0.4	6.791e+13	3.102e-04	6.597e-02	6.045e-07	1.285e-04
0.5	1.551e+13	6.672e-04	9.472e-02	1.310e-06	1.859e-04
0.6	7.887e+13	1.968e-02	1.979e+00	3.842e-05	3.863e-03
0.8	5.232e+13	1.856e-01	1.084e+01	3.531e-04	2.061e-02
1.0	1.112e+13	2.782e-01	1.076e+01	5.127e-04	1.983e-02
1.5	1.685e+13	1.110e+01	2.166e+02	1.868e-02	3.644e-01
2.0	3.529e+11	1.774e+00	2.304e+01	2.744e-03	3.563e-02
3.0	5.509e+11	3.154e+01	2.487e+02	4.279e-02	3.374e-01
TOTALS:	2.846e+14	4.490e+01	5.120e+02	6.511e-02	7.820e-01

For Information Only

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

Page : 1
DOS File: ASTCS480.MS5
Date: August 10, 2005
Time: 5:12:52 PM
Duration: 00:03:28

EC-RADN-1129
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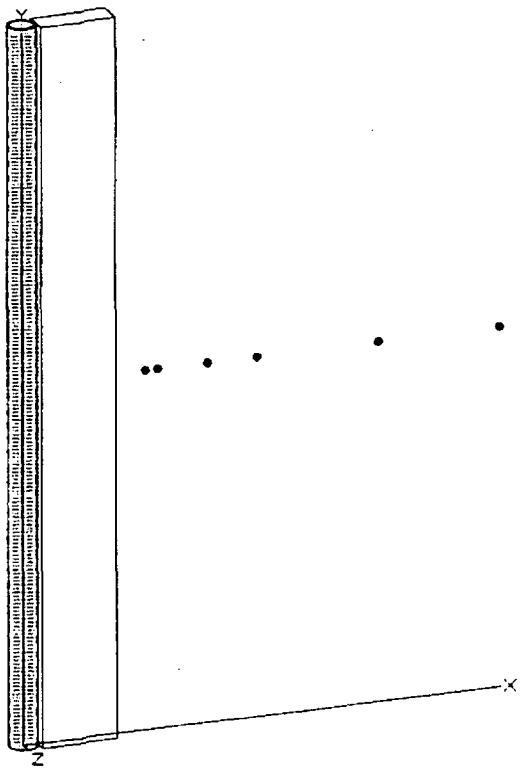
File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 14 inch core spray - Time = 480 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	7.1998e-004	2.6639e+007	8.8510e-004	3.2749e+001
Ba-137m	4.9672e+002	1.8379e+013	6.1064e+002	2.2594e+007
Ba-139				
Ba-140	1.6057e+002	5.9412e+012	1.9740e+002	7.3038e+006
Ce-141	7.1566e+000	2.6480e+011	8.7980e+000	3.2553e+005
Ce-143	4.2453e-004	1.5708e+007	5.2190e-004	1.9310e+001
Ce-144	8.7526e+000	3.2385e+011	1.0760e+001	3.9812e+005
Cm-242	1.4862e-001	5.4988e+009	1.8270e-001	6.7599e+003
Cm-244	9.4603e-003	3.5003e+008	1.1630e-002	4.3031e+002
Co-58	1.4813e-001	5.4807e+009	1.8210e-001	6.7377e+003
Co-60	9.6311e-002	3.5635e+009	1.1840e-001	4.3808e+003
Cs-134	6.8581e+002	2.5375e+013	8.4310e+002	3.1195e+007
Cs-136	7.7415e+001	2.8644e+012	9.5170e+001	3.5213e+006
Cs-137	5.2508e+002	1.9428e+013	6.4550e+002	2.3883e+007

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	6.9866e+002	2.5851e+013	8.5890e+002	3.1779e+007
I-132	1.5870e+001	5.8720e+011	1.9510e+001	7.2187e+005
I-133	9.1593e-004	3.3890e+007	1.1260e-003	4.1662e+001
I-134				
I-135				
La-140	1.8636e+002	6.8953e+012	2.2910e+002	8.4767e+006
La-141				
La-142				
Mo-99	3.9720e-001	1.4696e+010	4.8830e-001	1.8067e+004
Nb-95	4.4918e+000	1.6620e+011	5.5220e+000	2.0431e+005
Nd-147	4.9945e-001	1.8480e+010	6.1400e-001	2.2718e+004
Np-239	3.5808e-001	1.3249e+010	4.4020e-001	1.6287e+004
Pr-143	1.8148e+000	6.7147e+010	2.2310e+000	8.2547e+004
Pr-144	8.6274e+000	3.1922e+011	1.0606e+001	3.9243e+005
Pu-238	2.7763e-002	1.0272e+009	3.4130e-002	1.2628e+003
Pu-239	2.9764e-003	1.1013e+008	3.6590e-003	1.3538e+002
Pu-240	4.7318e-003	1.7508e+008	5.8170e-003	2.1523e+002
Pu-241	1.1640e+000	4.3069e+010	1.4310e+000	5.2947e+004
Rb-86	3.1366e+000	1.1606e+011	3.8560e+000	1.4267e+005
Rh-103m	3.6679e+001	1.3571e+012	4.5091e+001	1.6684e+006
Rh-105	3.1903e-003	1.1804e+008	3.9220e-003	1.4511e+002
Rh-106	2.0068e+001	7.4250e+011	2.4670e+001	9.1279e+005
Ru-103	3.6776e+001	1.3607e+012	4.5210e+001	1.6728e+006
Ru-105				
Ru-106	2.0068e+001	7.4250e+011	2.4670e+001	9.1279e+005
Sb-127	1.5594e+000	5.7696e+010	1.9170e+000	7.0929e+004
Sb-129				
Sr-89	1.9002e+002	7.0307e+012	2.3360e+002	8.6432e+006
Sr-90	3.1830e+001	1.1777e+012	3.9130e+001	1.4478e+006
Sr-91	1.9653e-013	7.2715e-003	2.4160e-013	8.9392e-009
Sr-92				
Tc-99m	4.0721e-001	1.5067e+010	5.0060e-001	1.8522e+004
Te-127	1.0485e+001	3.8795e+011	1.2890e+001	4.7693e+005
Te-127m	8.8258e+000	3.2656e+011	1.0850e+001	4.0145e+005
Te-129	2.3297e+001	8.6199e+011	2.8640e+001	1.0597e+006
Te-129m	2.6941e+001	9.9682e+011	3.3120e+001	1.2254e+006
Te-131m	1.9937e-003	7.3768e+007	2.4510e-003	9.0687e+001
Te-132	1.3300e+001	4.9209e+011	1.6350e+001	6.0495e+005
Y-90	3.1838e+001	1.1780e+012	3.9140e+001	1.4482e+006
Y-91	3.2294e+000	1.1949e+011	3.9700e+000	1.4689e+005
Y-92				
Y-93	1.2836e-014	4.7493e-004	1.5780e-014	5.8386e-010
Zr-95	3.7589e+000	1.3908e+011	4.6210e+000	1.7098e+005
Zr-97	1.3023e-008	4.8186e+002	1.6010e-008	5.9237e-004

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

DOS File: ASTCS480.MS5
Run Date: August 10, 2005
Run Time: 5:12:52 PM
Duration: 00:03:28

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.360e+08	0.000e+00	2.834e-26	0.000e+00	2.430e-27
0.02	1.178e+11	0.000e+00	3.862e-23	0.000e+00	1.338e-24
0.03	4.742e+12	8.617e-131	3.438e-21	8.540e-133	3.407e-23
0.04	5.147e+11	3.775e-63	9.897e-22	1.669e-65	4.377e-24
0.05	6.962e+10	2.314e-39	4.376e-22	6.163e-42	1.166e-24
0.06	3.596e+11	1.340e-27	1.623e-20	2.662e-30	3.223e-23
0.08	8.622e+11	5.037e-18	4.814e-16	7.971e-21	7.618e-19
0.1	6.403e+10	1.855e-15	4.124e-13	2.838e-18	6.310e-16
0.15	1.002e+12	1.471e-10	6.421e-08	2.422e-13	1.057e-10
0.2	9.418e+11	7.553e-09	3.683e-06	1.333e-11	6.500e-09
0.3	5.219e+12	4.584e-06	1.548e-03	8.695e-09	2.937e-06
0.4	2.152e+13	3.934e-04	8.347e-02	7.665e-07	1.626e-04
0.5	6.753e+12	1.160e-03	1.644e-01	2.276e-06	3.226e-04
0.6	5.026e+13	5.002e-02	5.022e+00	9.764e-05	9.803e-03
0.8	3.042e+13	4.297e-01	2.507e+01	8.173e-04	4.769e-02
1.0	4.517e+12	4.497e-01	1.739e+01	8.289e-04	3.206e-02
1.5	7.456e+12	1.958e+01	3.827e+02	3.294e-02	6.438e-01
2.0	8.044e+10	1.618e+00	2.108e+01	2.502e-03	3.259e-02
3.0	2.455e+11	5.671e+01	4.498e+02	7.694e-02	6.103e-01
TOTALS:	1.352e+14	7.884e+01	9.013e+02	1.141e-01	1.377e+00

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.360e+08	0.000e+00	2.514e-26	0.000e+00	2.156e-27
0.02	1.178e+11	0.000e+00	3.427e-23	0.000e+00	1.187e-24
0.03	4.742e+12	7.711e-131	3.050e-21	7.642e-133	3.023e-23
0.04	5.147e+11	3.468e-63	8.780e-22	1.534e-65	3.883e-24
0.05	6.962e+10	2.108e-39	3.883e-22	5.617e-42	1.034e-24
0.06	3.596e+11	1.219e-27	1.440e-20	2.420e-30	2.859e-23
0.08	8.622e+11	4.587e-18	4.384e-16	7.259e-21	6.938e-19
0.1	6.403e+10	1.691e-15	3.761e-13	2.588e-18	5.754e-16
0.15	1.002e+12	1.342e-10	5.859e-08	2.211e-13	9.648e-11
0.2	9.418e+11	6.893e-09	3.360e-06	1.217e-11	5.930e-09
0.3	5.219e+12	4.182e-06	1.412e-03	7.933e-09	2.679e-06
0.4	2.152e+13	3.588e-04	7.611e-02	6.991e-07	1.483e-04
0.5	6.753e+12	1.057e-03	1.498e-01	2.076e-06	2.941e-04
0.6	5.026e+13	4.560e-02	4.577e+00	8.901e-05	8.934e-03
0.8	3.042e+13	3.916e-01	2.284e+01	7.449e-04	4.345e-02
1.0	4.517e+12	4.097e-01	1.584e+01	7.552e-04	2.920e-02
1.5	7.456e+12	1.783e+01	3.484e+02	3.000e-02	5.862e-01
2.0	8.044e+10	1.473e+00	1.919e+01	2.278e-03	2.967e-02
3.0	2.455e+11	5.162e+01	4.094e+02	7.003e-02	5.554e-01
TOTALS:	1.352e+14	7.177e+01	8.205e+02	1.039e-01	1.253e+00

Results - Dose Point # 3 - (228.6,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.360e+08	0.000e+00	1.673e-26	0.000e+00	1.435e-27

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Duration: 00:03:28

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.178e+11	0.000e+00	2.280e-23	0.000e+00	7.899e-25
0.03	4.742e+12	5.701e-131	2.030e-21	5.650e-133	2.012e-23
0.04	5.147e+11	2.546e-63	5.843e-22	1.126e-65	2.584e-24
0.05	6.962e+10	1.533e-39	2.584e-22	4.085e-42	6.882e-25
0.06	3.596e+11	8.898e-28	9.579e-21	1.767e-30	1.903e-23
0.08	8.622e+11	3.366e-18	3.217e-16	5.326e-21	5.091e-19
0.1	6.403e+10	1.243e-15	2.765e-13	1.902e-18	4.230e-16
0.15	1.002e+12	9.884e-11	4.313e-08	1.628e-13	7.103e-11
0.2	9.418e+11	5.077e-09	2.474e-06	8.960e-12	4.367e-09
0.3	5.219e+12	3.080e-06	1.040e-03	5.842e-09	1.972e-06
0.4	2.152e+13	2.641e-04	5.602e-02	5.147e-07	1.091e-04
0.5	6.753e+12	7.783e-04	1.102e-01	1.528e-06	2.164e-04
0.6	5.026e+13	3.356e-02	3.367e+00	6.550e-05	6.572e-03
0.8	3.042e+13	2.881e-01	1.680e+01	5.479e-04	3.195e-02
1.0	4.517e+12	3.013e-01	1.165e+01	5.553e-04	2.147e-02
1.5	7.456e+12	1.311e+01	2.560e+02	2.205e-02	4.308e-01
2.0	8.044e+10	1.082e+00	1.409e+01	1.674e-03	2.179e-02
3.0	2.455e+11	3.791e+01	3.006e+02	5.143e-02	4.078e-01
TOTALS:	1.352e+14	5.272e+01	6.027e+02	7.632e-02	9.207e-01

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.360e+08	0.000e+00	1.200e-26	0.000e+00	1.029e-27
0.02	1.178e+11	0.000e+00	1.636e-23	0.000e+00	5.666e-25
0.03	4.742e+12	4.467e-131	1.456e-21	4.427e-133	1.443e-23
0.04	5.147e+11	1.978e-63	4.191e-22	8.747e-66	1.854e-24
0.05	6.962e+10	1.199e-39	1.853e-22	3.193e-42	4.937e-25
0.06	3.596e+11	6.967e-28	6.871e-21	1.384e-30	1.365e-23
0.08	8.622e+11	2.640e-18	2.524e-16	4.178e-21	3.994e-19
0.1	6.403e+10	9.763e-16	2.172e-13	1.494e-18	3.323e-16
0.15	1.002e+12	7.772e-11	3.393e-08	1.280e-13	5.588e-11
0.2	9.418e+11	3.995e-09	1.948e-06	7.051e-12	3.437e-09
0.3	5.219e+12	2.425e-06	8.188e-04	4.599e-09	1.553e-06
0.4	2.152e+13	2.081e-04	4.413e-02	4.054e-07	8.599e-05
0.5	6.753e+12	6.132e-04	8.687e-02	1.204e-06	1.705e-04
0.6	5.026e+13	2.644e-02	2.654e+00	5.161e-05	5.180e-03
0.8	3.042e+13	2.270e-01	1.324e+01	4.318e-04	2.519e-02
1.0	4.517e+12	2.375e-01	9.182e+00	4.378e-04	1.693e-02
1.5	7.456e+12	1.033e+01	2.019e+02	1.739e-02	3.397e-01
2.0	8.044e+10	8.535e-01	1.112e+01	1.320e-03	1.719e-02
3.0	2.455e+11	2.990e+01	2.371e+02	4.056e-02	3.217e-01
TOTALS:	1.352e+14	4.158e+01	4.753e+02	6.019e-02	7.261e-01

Results - Dose Point # 5 - (441.96,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.360e+08	0.000e+00	6.267e-27	0.000e+00	5.375e-28

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[redacted]gy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	1.178e+11	0.000e+00	8.542e-24	0.000e+00	2.959e-25
0.03	4.742e+12	2.753e-131	7.604e-22	2.729e-133	7.536e-24
0.04	5.147e+11	1.246e-63	2.189e-22	5.512e-66	9.680e-25
0.05	6.962e+10	7.602e-40	9.678e-23	2.025e-42	2.578e-25
0.06	3.596e+11	4.434e-28	3.589e-21	8.808e-31	7.128e-24
0.08	8.622e+11	1.687e-18	1.613e-16	2.669e-21	2.553e-19
0.1	6.403e+10	6.253e-16	1.392e-13	9.566e-19	2.130e-16
0.15	1.002e+12	4.994e-11	2.183e-08	8.224e-14	3.595e-11
0.2	9.418e+11	2.572e-09	1.256e-06	4.539e-12	2.216e-09
0.3	5.219e+12	1.565e-06	5.292e-04	2.968e-09	1.004e-06
0.4	2.152e+13	1.345e-04	2.856e-02	2.620e-07	5.565e-05
0.5	6.753e+12	3.968e-04	5.628e-02	7.789e-07	1.105e-04
0.6	5.026e+13	1.713e-02	1.721e+00	3.343e-05	3.359e-03
0.8	3.042e+13	1.473e-01	8.596e+00	2.801e-04	1.635e-02
1.0	4.517e+12	1.542e-01	5.965e+00	2.842e-04	1.100e-02
1.5	7.456e+12	6.716e+00	1.313e+02	1.130e-02	2.208e-01
2.0	8.044e+10	5.548e-01	7.225e+00	8.580e-04	1.117e-02
3.0	2.455e+11	1.942e+01	1.538e+02	2.635e-02	2.087e-01
TOTALS:	1.352e+14	2.701e+01	3.087e+02	3.910e-02	4.716e-01

Results - Dose Point # 6 - (594.36,457.2,0) cm

[redacted]gy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.360e+08	0.000e+00	3.808e-27	0.000e+00	3.266e-28
0.02	1.178e+11	0.000e+00	5.190e-24	0.000e+00	1.798e-25
0.03	4.742e+12	1.930e-131	4.620e-22	1.913e-133	4.579e-24
0.04	5.147e+11	8.889e-64	1.330e-22	3.932e-66	5.882e-25
0.05	6.962e+10	5.458e-40	5.880e-23	1.454e-42	1.567e-25
0.06	3.596e+11	3.194e-28	2.180e-21	6.343e-31	4.331e-24
0.08	8.622e+11	1.219e-18	1.166e-16	1.929e-21	1.846e-19
0.1	6.403e+10	4.528e-16	1.009e-13	6.927e-19	1.544e-16
0.15	1.002e+12	3.628e-11	1.588e-08	5.974e-14	2.616e-11
0.2	9.418e+11	1.872e-09	9.155e-07	3.304e-12	1.616e-09
0.3	5.219e+12	1.142e-06	3.868e-04	2.167e-09	7.338e-07
0.4	2.152e+13	9.832e-05	2.091e-02	1.916e-07	4.074e-05
0.5	6.753e+12	2.904e-04	4.123e-02	5.701e-07	8.094e-05
0.6	5.026e+13	1.254e-02	1.261e+00	2.449e-05	2.462e-03
0.8	3.042e+13	1.079e-01	6.301e+00	2.053e-04	1.198e-02
1.0	4.517e+12	1.130e-01	4.370e+00	2.083e-04	8.055e-03
1.5	7.456e+12	4.912e+00	9.583e+01	8.264e-03	1.612e-01
2.0	8.044e+10	4.045e-01	5.252e+00	6.255e-04	8.121e-03
3.0	2.455e+11	1.406e+01	1.108e+02	1.907e-02	1.504e-01
TOTALS:	1.352e+14	1.961e+01	2.239e+02	2.840e-02	3.423e-01

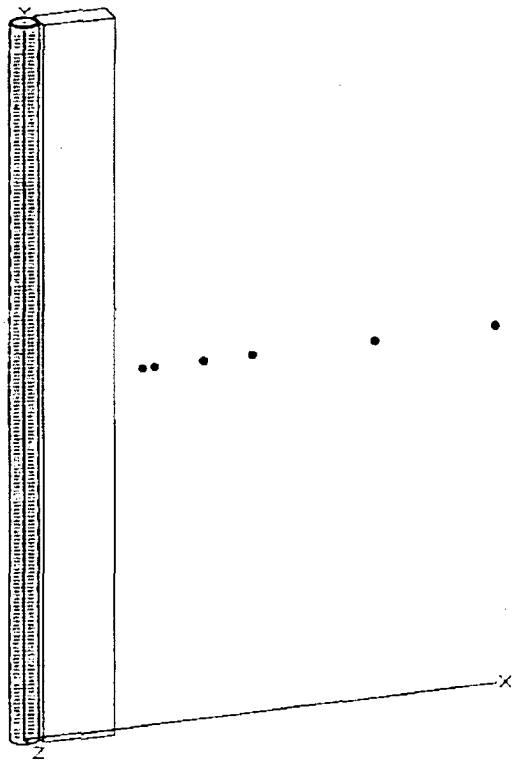
[redacted]

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

Page : 1
DOS File: ASTCS720.MS5
Run Date: August 30, 2005
Run Time: 1:20:27 PM
Duration: 00:03:16

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

Case Title: Control Room
Description: 14 inch core spray - Time = 720 hour
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
# 2	167.64 cm	457.2 cm	0 cm
	5 ft 6.0 in	15 ft	0.0 in
# 3	228.6 cm	457.2 cm	0 cm
	7 ft 6.0 in	15 ft	0.0 in
# 4	289.56 cm	457.2 cm	0 cm
	9 ft 6.0 in	15 ft	0.0 in
# 5	441.96 cm	457.2 cm	0 cm
	14 ft 6.0 in	15 ft	0.0 in
# 6	594.36 cm	457.2 cm	0 cm
	19 ft 6.0 in	15 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	5.7592e-004	2.1309e+007	7.0800e-004	2.6196e+001
Ba-137m	3.7083e+002	1.3721e+013	4.5588e+002	1.6867e+007
Ba-139				
Ba-140	6.9606e+001	2.5754e+012	8.5570e+001	3.1661e+006
Ce-141	4.3194e+000	1.5982e+011	5.3100e+000	1.9647e+005
Ce-143	2.0507e-006	7.5875e+004	2.5210e-006	9.3277e-002
Ce-144	6.3839e+000	2.3620e+011	7.8480e+000	2.9038e+005
Cm-242	1.0640e-001	3.9367e+009	1.3080e-001	4.8396e+003
Cm-244	7.0623e-003	2.6130e+008	8.6820e-003	3.2123e+002
Co-58	1.0038e-001	3.7140e+009	1.2340e-001	4.5658e+003
Co-60	7.1656e-002	2.6513e+009	8.8090e-002	3.2593e+003
Cs-134	5.0767e+002	1.8784e+013	6.2410e+002	2.3092e+007
Cs-136	3.4067e+001	1.2605e+012	4.1880e+001	1.5496e+006
Cs-137	3.9200e+002	1.4504e+013	4.8190e+002	1.7830e+007

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Run Date: August 30, 2005
Run Time: 1:20:27 PM
Duration: 00:03:16

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
I-131	2.2036e+002	8.1533e+012	2.7090e+002	1.0023e+007
I-132	1.4129e+000	5.2279e+010	1.7370e+000	6.4269e+004
I-133	2.3004e-007	8.5115e+003	2.8280e-007	1.0464e-002
I-134				
I-135				
La-140	8.0848e+001	2.9914e+012	9.9390e+001	3.6774e+006
La-141				
La-142				
Mo-99	2.3858e-002	8.8275e+008	2.9330e-002	1.0852e+003
Nb-95	3.2253e+000	1.1934e+011	3.9650e+000	1.4671e+005
Nd-147	1.9848e-001	7.3437e+009	2.4400e-001	9.0280e+003
Np-239	1.4097e-002	5.2159e+008	1.7330e-002	6.4121e+002
Pr-143	8.1303e-001	3.0082e+010	9.9950e-001	3.6982e+004
Pr-144	6.2926e+000	2.3283e+011	7.7358e+000	2.8622e+005
Pu-238	2.0759e-002	7.6808e+008	2.5520e-002	9.4424e+002
Pu-239	2.2231e-003	8.2256e+007	2.7330e-003	1.0112e+002
Pu-240	3.5344e-003	1.3077e+008	4.3450e-003	1.6076e+002
Pu-241	8.6794e-001	3.2114e+010	1.0670e+000	3.9479e+004
Rb-86	1.6163e+000	5.9803e+010	1.9870e+000	7.3519e+004
Rh-103m	2.2968e+001	8.4981e+011	2.8236e+001	1.0447e+006
Rh-105	2.1572e-005	7.9818e+005	2.6520e-005	9.8124e-001
Rh-106	1.4715e+001	5.4446e+011	1.8090e+001	6.6933e+005
Ru-103	2.3028e+001	8.5205e+011	2.8310e+001	1.0475e+006
Ru-105				
Ru-106	1.4715e+001	5.4446e+011	1.8090e+001	6.6933e+005
Sb-127	1.9254e-001	7.1240e+009	2.3670e-001	8.7579e+003
Sb-129				
Sr-89	1.2372e+002	4.5778e+012	1.5210e+002	5.6277e+006
Sr-90	2.3761e+001	8.7914e+011	2.9210e+001	1.0808e+006
Sr-91				
Sr-92				
Tc-99m	2.4460e-002	9.0502e+008	3.0070e-002	1.1126e+003
Te-127	6.5026e+000	2.4060e+011	7.9940e+000	2.9578e+005
Te-127m	6.1935e+000	2.2916e+011	7.6140e+000	2.8172e+005
Te-129	1.4162e+001	5.2399e+011	1.7410e+001	6.4417e+005
Te-129m	1.6375e+001	6.0586e+011	2.0130e+001	7.4481e+005
Te-131m	5.8185e-006	2.1529e+005	7.1530e-006	2.6466e-001
Te-132	1.1836e+000	4.3792e+010	1.4550e+000	5.3835e+004
Y-90	2.3883e+001	8.8366e+011	2.9360e+001	1.0863e+006
Y-91	2.1426e+000	7.9276e+010	2.6340e+000	9.7458e+004
Y-92				
Y-93				
Zr-95	2.5192e+000	9.3211e+010	3.0970e+000	1.1459e+005
Zr-97	5.1637e-013	1.9106e-002	6.3480e-013	2.3488e-008

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results - Dose Point # 1 - (152.4,457.2,0) cm

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	9.763e+07	0.000e+00	2.035e-26	0.000e+00	1.745e-27
0.02	7.287e+10	0.000e+00	2.390e-23	0.000e+00	8.277e-25
0.03	2.295e+12	4.170e-131	1.664e-21	4.133e-133	1.649e-23
0.04	3.311e+11	2.428e-63	6.366e-22	1.074e-65	2.815e-24
0.05	8.924e+09	2.966e-40	5.610e-23	7.900e-43	1.494e-25
0.06	1.584e+11	5.903e-28	7.146e-21	1.172e-30	1.419e-23
0.08	2.966e+11	1.733e-18	1.656e-16	2.742e-21	2.621e-19
0.1	1.772e+10	5.133e-16	1.141e-13	7.852e-19	1.746e-16
0.15	4.633e+11	6.801e-11	2.968e-08	1.120e-13	4.888e-11
0.2	2.525e+11	2.025e-09	9.874e-07	3.575e-12	1.743e-09
0.3	2.072e+12	1.820e-06	6.147e-04	3.452e-09	1.166e-06
0.4	6.848e+12	1.252e-04	2.656e-02	2.439e-07	5.175e-05
0.5	3.270e+12	5.616e-04	7.960e-02	1.102e-06	1.562e-04
0.6	3.597e+13	3.580e-02	3.594e+00	6.987e-05	7.015e-03
0.8	2.037e+13	2.877e-01	1.678e+01	5.472e-04	3.193e-02
1.0	2.143e+12	2.134e-01	8.253e+00	3.933e-04	1.521e-02
1.5	3.443e+12	9.041e+00	1.767e+02	1.521e-02	2.973e-01
2.0	2.897e+10	5.827e-01	7.591e+00	9.011e-04	1.174e-02
3.0	1.065e+11	2.460e+01	1.952e+02	3.338e-02	2.648e-01
TOTALS:	7.815e+13	3.476e+01	4.082e+02	5.050e-02	6.281e-01

Results - Dose Point # 2 - (167.64,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	9.763e+07	0.000e+00	1.805e-26	0.000e+00	1.548e-27
0.02	7.287e+10	0.000e+00	2.120e-23	0.000e+00	7.344e-25
0.03	2.295e+12	3.732e-131	1.476e-21	3.698e-133	1.463e-23
0.04	3.311e+11	2.231e-63	5.648e-22	9.867e-66	2.498e-24
0.05	8.924e+09	2.703e-40	4.977e-23	7.200e-43	1.326e-25
0.06	1.584e+11	5.367e-28	6.340e-21	1.066e-30	1.259e-23
0.08	2.966e+11	1.578e-18	1.508e-16	2.497e-21	2.387e-19
0.1	1.772e+10	4.680e-16	1.041e-13	7.160e-19	1.592e-16
0.15	4.633e+11	6.206e-11	2.709e-08	1.022e-13	4.461e-11
0.2	2.525e+11	1.848e-09	9.010e-07	3.262e-12	1.590e-09
0.3	2.072e+12	1.660e-06	5.606e-04	3.149e-09	1.063e-06
0.4	6.848e+12	1.142e-04	2.422e-02	2.224e-07	4.718e-05
0.5	3.270e+12	5.121e-04	7.256e-02	1.005e-06	1.424e-04
0.6	3.597e+13	3.263e-02	3.276e+00	6.370e-05	6.394e-03
0.8	2.037e+13	2.622e-01	1.529e+01	4.987e-04	2.909e-02
1.0	2.143e+12	1.944e-01	7.518e+00	3.584e-04	1.386e-02
1.5	3.443e+12	8.234e+00	1.609e+02	1.385e-02	2.707e-01
2.0	2.897e+10	5.306e-01	6.911e+00	8.205e-04	1.069e-02
3.0	1.065e+11	2.239e+01	1.776e+02	3.038e-02	2.410e-01
TOTALS:	7.815e+13	3.165e+01	3.716e+02	4.598e-02	5.719e-01

Results - Dose Point # 3 - (228.6,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	9.763e+07	0.000e+00	1.201e-26	0.000e+00	1.030e-27

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	7.287e+10	0.000e+00	1.411e-23	0.000e+00	4.887e-25
0.03	2.295e+12	2.759e-131	9.824e-22	2.734e-133	9.736e-24
0.04	3.311e+11	1.638e-63	3.758e-22	7.242e-66	1.662e-24
0.05	8.924e+09	1.966e-40	3.312e-23	5.236e-43	8.822e-26
0.06	1.584e+11	3.919e-28	4.219e-21	7.783e-31	8.380e-24
0.08	2.966e+11	1.158e-18	1.107e-16	1.832e-21	1.752e-19
0.1	1.772e+10	3.440e-16	7.651e-14	5.263e-19	1.170e-16
0.15	4.633e+11	4.569e-11	1.994e-08	7.525e-14	3.284e-11
0.2	2.525e+11	1.361e-09	6.634e-07	2.403e-12	1.171e-09
0.3	2.072e+12	1.223e-06	4.128e-04	2.319e-09	7.829e-07
0.4	6.848e+12	8.404e-05	1.782e-02	1.638e-07	3.473e-05
0.5	3.270e+12	3.769e-04	5.339e-02	7.398e-07	1.048e-04
0.6	3.597e+13	2.401e-02	2.410e+00	4.687e-05	4.703e-03
0.8	2.037e+13	1.929e-01	1.125e+01	3.668e-04	2.139e-02
1.0	2.143e+12	1.430e-01	5.527e+00	2.635e-04	1.019e-02
1.5	3.443e+12	6.051e+00	1.182e+02	1.018e-02	1.989e-01
2.0	2.897e+10	3.898e-01	5.076e+00	6.028e-04	7.850e-03
3.0	1.065e+11	1.645e+01	1.304e+02	2.231e-02	1.769e-01
TOTALS:	7.815e+13	2.325e+01	2.730e+02	3.377e-02	4.201e-01

Results - Dose Point # 4 - (289.56,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	9.763e+07	0.000e+00	8.616e-27	0.000e+00	7.390e-28
0.02	7.287e+10	0.000e+00	1.012e-23	0.000e+00	3.505e-25
0.03	2.295e+12	2.162e-131	7.046e-22	2.143e-133	6.983e-24
0.04	3.311e+11	1.272e-63	2.696e-22	5.627e-66	1.192e-24
0.05	8.924e+09	1.536e-40	2.376e-23	4.093e-43	6.328e-26
0.06	1.584e+11	3.068e-28	3.026e-21	6.094e-31	6.011e-24
0.08	2.966e+11	9.082e-19	8.682e-17	1.437e-21	1.374e-19
0.1	1.772e+10	2.701e-16	6.009e-14	4.133e-19	9.194e-17
0.15	4.633e+11	3.593e-11	1.569e-08	5.917e-14	2.583e-11
0.2	2.525e+11	1.071e-09	5.222e-07	1.891e-12	9.217e-10
0.3	2.072e+12	9.626e-07	3.251e-04	1.826e-09	6.166e-07
0.4	6.848e+12	6.619e-05	1.404e-02	1.290e-07	2.736e-05
0.5	3.270e+12	2.969e-04	4.207e-02	5.829e-07	8.258e-05
0.6	3.597e+13	1.892e-02	1.899e+00	3.693e-05	3.707e-03
0.8	2.037e+13	1.520e-01	8.865e+00	2.891e-04	1.686e-02
1.0	2.143e+12	1.127e-01	4.357e+00	2.077e-04	8.032e-03
1.5	3.443e+12	4.771e+00	9.322e+01	8.027e-03	1.568e-01
2.0	2.897e+10	3.074e-01	4.003e+00	4.753e-04	6.191e-03
3.0	1.065e+11	1.297e+01	1.029e+02	1.760e-02	1.395e-01
TOTALS:	7.815e+13	1.833e+01	2.153e+02	2.663e-02	3.313e-01

Results - Dose Point # 5 - (441.96,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	9.763e+07	0.000e+00	4.500e-27	0.000e+00	3.860e-28

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.02	7.287e+10	0.000e+00	5.285e-24	0.000e+00	1.831e-25
0.03	2.295e+12	1.332e-131	3.680e-22	1.321e-133	3.647e-24
0.04	3.311e+11	8.017e-64	1.408e-22	3.546e-66	6.226e-25
0.05	8.924e+09	9.745e-41	1.241e-23	2.596e-43	3.305e-26
0.06	1.584e+11	1.953e-28	1.580e-21	3.879e-31	3.139e-24
0.08	2.966e+11	5.803e-19	5.550e-17	9.183e-22	8.783e-20
0.1	1.772e+10	1.730e-16	3.853e-14	2.647e-19	5.894e-17
0.15	4.633e+11	2.309e-11	1.009e-08	3.802e-14	1.662e-11
0.2	2.525e+11	6.896e-10	3.367e-07	1.217e-12	5.942e-10
0.3	2.072e+12	6.213e-07	2.101e-04	1.178e-09	3.985e-07
0.4	6.848e+12	4.279e-05	9.088e-03	8.337e-08	1.771e-05
0.5	3.270e+12	1.922e-04	2.726e-02	3.772e-07	5.350e-05
0.6	3.597e+13	1.226e-02	1.231e+00	2.392e-05	2.404e-03
0.8	2.037e+13	9.859e-02	5.755e+00	1.875e-04	1.095e-02
1.0	2.143e+12	7.316e-02	2.831e+00	1.349e-04	5.218e-03
1.5	3.443e+12	3.101e+00	6.061e+01	5.217e-03	1.020e-01
2.0	2.897e+10	1.998e-01	2.602e+00	3.090e-04	4.024e-03
3.0	1.065e+11	8.425e+00	6.674e+01	1.143e-02	9.054e-02
TOTALS:	7.815e+13	1.191e+01	1.398e+02	1.730e-02	2.152e-01

Results - Dose Point # 6 - (594.36,457.2,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	9.763e+07	0.000e+00	2.734e-27	0.000e+00	2.345e-28
0.02	7.287e+10	0.000e+00	3.211e-24	0.000e+00	1.112e-25
0.03	2.295e+12	9.341e-132	2.236e-22	9.257e-134	2.216e-24
0.04	3.311e+11	5.718e-64	8.554e-23	2.529e-66	3.783e-25
0.05	8.924e+09	6.996e-41	7.538e-24	1.864e-43	2.008e-26
0.06	1.584e+11	1.407e-28	9.603e-22	2.794e-31	1.907e-24
0.08	2.966e+11	4.194e-19	4.013e-17	6.636e-22	6.350e-20
0.1	1.772e+10	1.253e-16	2.793e-14	1.917e-19	4.273e-17
0.15	4.633e+11	1.677e-11	7.344e-09	2.762e-14	1.209e-11
0.2	2.525e+11	5.020e-10	2.455e-07	8.860e-13	4.333e-10
0.3	2.072e+12	4.534e-07	1.536e-04	8.601e-10	2.913e-07
0.4	6.848e+12	3.128e-05	6.652e-03	6.095e-08	1.296e-05
0.5	3.270e+12	1.407e-04	1.997e-02	2.761e-07	3.920e-05
0.6	3.597e+13	8.977e-03	9.025e-01	1.752e-05	1.762e-03
0.8	2.037e+13	7.226e-02	4.218e+00	1.374e-04	8.023e-03
1.0	2.143e+12	5.362e-02	2.074e+00	9.883e-05	3.822e-03
1.5	3.443e+12	2.268e+00	4.425e+01	3.816e-03	7.445e-02
2.0	2.897e+10	1.457e-01	1.891e+00	2.253e-04	2.925e-03
3.0	1.065e+11	6.098e+00	4.808e+01	8.274e-03	6.523e-02
TOTALS:	7.815e+13	8.647e+00	1.014e+02	1.257e-02	1.563e-01

For Information Only

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.	PROJECT	Calc. No. EC-RADN-1129
Date 08/31/2005	DBA-LOCA Total Control Room Dose	
Designed By T.F. Mackay		Sh. No. 406
Checked By M.M. Waselus		

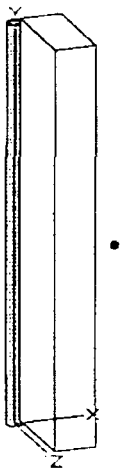
ATTACHMENT 9
MICROSHIELD COMPUTER CODE OUTPUT
14"GBB-101 SHINE TO MAIN CONTROL ROOM / TSC

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

Page : 1
DOS File: 1CS166.MS5
Run Date: August 28, 2005
Run Time: 2:12:48 PM
Duration: 00:00:28

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

Case Title: Control Room
Description: 14 inch core spray - Time = 0.1667 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241				
Ba-137m	5.9360e+001	2.1963e+012	7.2974e+001	2.7001e+006
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	8.3378e+001	3.0850e+012	1.0250e+002	3.7925e+006
Cs-136	2.6608e+001	9.8448e+011	3.2710e+001	1.2103e+006
Cs-137	6.2749e+001	2.3217e+012	7.7140e+001	2.8542e+006
I-131	3.8736e+002	1.4332e+013	4.7620e+002	1.7619e+007
I-132	5.4777e+002	2.0267e+013	6.7340e+002	2.4916e+007
I-133	8.0140e+002	2.9652e+013	9.8520e+002	3.6452e+007
I-134	7.7944e+002	2.8839e+013	9.5820e+002	3.5453e+007
I-135	7.5170e+002	2.7813e+013	9.2410e+002	3.4192e+007
La-140				
La-141				
La-142				
Mo-99				
Nb-95				

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Duration: 00:00:28

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	7.8668e-001	2.9107e+010	9.6710e-001	3.5783e+004
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	1.750e+12	7.329e-195	6.700e-22	7.264e-197	6.640e-24
0.04	6.766e+10	8.373e-96	6.868e-23	3.703e-98	3.037e-25
[illegible]6	1.227e+11	1.818e-43	2.922e-21	3.611e-46	5.804e-24
[illegible]08	4.371e+11	1.508e-29	2.477e-20	2.387e-32	3.919e-23
0.1	4.024e+09	3.240e-26	1.054e-21	4.957e-29	1.613e-24

DOS File: 1CS166.MS5
Run Date: August 28, 2005
Run Time: 2:12:48 PM
Duration: 00:00:28

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.15	1.560e+12	3.037e-18	3.208e-15	5.001e-21	5.282e-18
0.2	1.600e+12	1.052e-15	1.391e-12	1.857e-18	2.455e-15
0.3	3.401e+12	2.093e-12	1.852e-09	3.969e-15	3.512e-12
0.4	1.734e+13	8.882e-10	4.557e-07	1.731e-12	8.879e-10
0.5	3.712e+13	4.963e-08	1.589e-05	9.742e-11	3.120e-08
0.6	4.301e+13	7.414e-07	1.586e-04	1.447e-09	3.097e-07
0.8	7.855e+13	6.401e-05	7.392e-03	1.218e-07	1.406e-05
1.0	3.036e+13	4.212e-04	3.022e-02	7.763e-07	5.571e-05
1.5	2.289e+13	3.629e-02	1.201e+00	6.106e-05	2.021e-03
2.0	6.038e+12	1.799e-01	3.777e+00	2.782e-04	5.841e-03
TOTALS:	2.442e+14	2.167e-01	5.016e+00	3.402e-04	7.931e-03

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

Page : 1
DOS File: 1CS05.MS5
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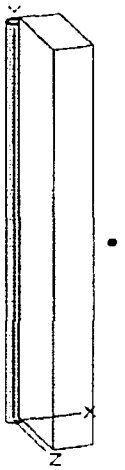
Duration: 00:00:28

EC-RADN-1129
Page 410

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

Case Title: Control Room
Description: 14 inch core spray - Time = 0.5 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241				
Ba-137m	1.7799e+002	6.5856e+012	2.1881e+002	8.0960e+006
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	2.4997e+002	9.2489e+012	3.0730e+002	1.1370e+007
Cs-136	7.9733e+001	2.9501e+012	9.8020e+001	3.6267e+006
Cs-137	1.8815e+002	6.9615e+012	2.3130e+002	8.5581e+006
I-131	1.1600e+003	4.2919e+013	1.4260e+003	5.2762e+007
I-132	1.5618e+003	5.7787e+013	1.9200e+003	7.1040e+007
I-133	2.3769e+003	8.7944e+013	2.9220e+003	1.0811e+008
I-134	1.7961e+003	6.6455e+013	2.2080e+003	8.1696e+007
I-135	2.1768e+003	8.0540e+013	2.6760e+003	9.9012e+007
La-140				
La-141				
La-142				
Mo-99				
Nb-95				

DOS File: 1CS05.MS5
Run Date: August 28, 2005
Run Time: 2:11:06 PM
Duration: 00:00:28

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	2.3573e+000	8.7222e+010	2.8980e+000	1.0723e+005
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	4.912e+12	2.057e-194	1.880e-21	2.038e-196	1.863e-23
0.04	2.028e+11	2.510e-95	2.059e-22	1.110e-97	9.105e-25
[illegible]6	3.677e+11	5.448e-43	8.757e-21	1.082e-45	1.739e-23
[illegible].08	1.309e+12	4.517e-29	7.418e-20	7.148e-32	1.174e-22
0.1	1.206e+10	9.710e-26	3.159e-21	1.486e-28	4.832e-24

DOS File: 1CS05.MS5
Run Date: August 28, 2005
Run Time: 2:11:06 PM
Duration: 00:00:28

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.15	3.708e+12	7.218e-18	7.623e-15	1.189e-20	1.255e-17
0.2	4.150e+12	2.729e-15	3.608e-12	4.817e-18	6.368e-15
0.3	9.883e+12	6.080e-12	5.380e-09	1.153e-14	1.020e-11
0.4	4.920e+13	2.520e-09	1.293e-06	4.910e-12	2.519e-09
0.5	1.069e+14	1.429e-07	4.576e-05	2.805e-10	8.983e-08
0.6	1.183e+14	2.040e-06	4.365e-04	3.981e-09	8.519e-07
0.8	1.972e+14	1.607e-04	1.856e-02	3.056e-07	3.529e-05
1.0	8.122e+13	1.127e-03	8.086e-02	2.077e-06	1.490e-04
1.5	6.391e+13	1.013e-01	3.354e+00	1.705e-04	5.642e-03
2.0	1.609e+13	4.794e-01	1.006e+01	7.413e-04	1.556e-02
TOTALS:	6.573e+14	5.820e-01	1.352e+01	9.142e-04	2.139e-02

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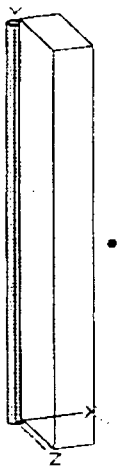
Pennsylvania Power & Light Co.

Page : 1
DOS File: 1CS1.MS5
Date: August 28, 2005
Time: 2:11:35 PM
Duration: 00:00:36

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

Case Title: Control Room
Description: 14 inch core spray - Time = 1 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	3.6849e-004	1.3634e+007	4.5300e-004	1.6761e+001
Ba-137m	4.1523e+002	1.5363e+013	5.1046e+002	1.8887e+007
Ba-139	1.7115e+002	6.3325e+012	2.1040e+002	7.7848e+006
Ba-140	2.8357e+002	1.0492e+013	3.4860e+002	1.2898e+007
Ce-141	6.5189e+000	2.4120e+011	8.0140e+000	2.9652e+005
Ce-143	5.9267e+000	2.1929e+011	7.2860e+000	2.6958e+005
Ce-144	5.4818e+000	2.0283e+011	6.7390e+000	2.4934e+005
Cm-242	9.6474e-002	3.5695e+009	1.1860e-001	4.3882e+003
Cm-244	5.6550e-003	2.0924e+008	6.9520e-003	2.5722e+002
Co-58	1.0737e-001	3.9728e+009	1.3200e-001	4.8840e+003
Co-60	5.7819e-002	2.1393e+009	7.1080e-002	2.6300e+003
Cs-134	5.8315e+002	2.1577e+013	7.1690e+002	2.6525e+007
Cs-136	1.8579e+002	6.8742e+012	2.2840e+002	8.4508e+006
Cs-137	4.3893e+002	1.6240e+013	5.3960e+002	1.9965e+007
I-131	3.0886e+003	1.1428e+014	3.7970e+003	1.4049e+008
I-132	3.9875e+003	1.4754e+014	4.9020e+003	1.8137e+008
I-133	6.2318e+003	2.3058e+014	7.6610e+003	2.8346e+008
I-134	3.2245e+003	1.1931e+014	3.9640e+003	1.4667e+008
I-135	5.5070e+003	2.0376e+014	6.7700e+003	2.5049e+008
La-140	4.4731e+000	1.6550e+011	5.4990e+000	2.0346e+005
La-141	2.1621e+000	7.9999e+010	2.6580e+000	9.8346e+004
La-142	1.6106e+000	5.9593e+010	1.9800e+000	7.3260e+004
Mo-99	3.6239e+001	1.3408e+012	4.4550e+001	1.6483e+006
Nb-95	2.7836e+000	1.0299e+011	3.4220e+000	1.2661e+005

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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	1.0502e+000	3.8856e+010	1.2910e+000	4.7767e+004
Np-239	7.5967e+001	2.8108e+012	9.3390e+001	3.4554e+006
Pr-143	2.3354e+000	8.6409e+010	2.8710e+000	1.0623e+005
Pr-144	5.4034e+000	1.9993e+011	6.6426e+000	2.4578e+005
Pu-238	1.6521e-002	6.1128e+008	2.0310e-002	7.5147e+002
Pu-239	1.7546e-003	6.4920e+007	2.1570e-003	7.9809e+001
Pu-240	2.8218e-003	1.0441e+008	3.4690e-003	1.2835e+002
Pu-241	6.9590e-001	2.5748e+010	8.5550e-001	3.1653e+004
Rb-86	5.4956e+000	2.0334e+011	6.7560e+000	2.4997e+005
Rh-103m	3.1105e+001	1.1509e+012	3.8239e+001	1.4148e+006
Rh-105	2.0100e+001	7.4370e+011	2.4710e+001	9.1427e+005
Rh-106	1.2429e+001	4.5989e+011	1.5280e+001	5.6536e+005
Ru-103	3.1187e+001	1.1539e+012	3.8340e+001	1.4186e+006
Ru-105	1.8449e+001	6.8261e+011	2.2680e+001	8.3916e+005
Ru-106	1.2429e+001	4.5989e+011	1.5280e+001	5.6536e+005
Sb-127	3.3807e+001	1.2508e+012	4.1560e+001	1.5377e+006
Sb-129	1.0721e+002	3.9668e+012	1.3180e+002	4.8766e+006
Sr-89	1.4902e+002	5.5138e+012	1.8320e+002	6.7784e+006
Sr-90	1.9002e+001	7.0307e+011	2.3360e+001	8.6432e+005
Sr-91	1.7668e+002	6.5371e+012	2.1720e+002	8.0364e+006
Sr-92	1.5626e+002	5.7817e+012	1.9210e+002	7.1077e+006
Tc-99m	3.2432e+001	1.2000e+012	3.9870e+001	1.4752e+006
Te-127	3.3758e+001	1.2490e+012	4.1500e+001	1.5355e+006
Te-127m	5.7600e+000	2.1312e+011	7.0810e+000	2.6200e+005
Te-129	1.1404e+002	4.2196e+012	1.4020e+002	5.1874e+006
Te-129m	2.4127e+001	8.9268e+011	2.9660e+001	1.0974e+006
Te-131m	7.6146e+001	2.8174e+012	9.3610e+001	3.4636e+006
Te-132	5.5355e+002	2.0481e+013	6.8050e+002	2.5179e+007
Y-90	2.5802e-001	9.5469e+009	3.1720e-001	1.1736e+004
Y-91	1.9523e+000	7.2233e+010	2.4000e+000	8.8800e+004
Y-92	1.1258e+001	4.1655e+011	1.3840e+001	5.1208e+005
Y-93	1.4471e+000	5.3543e+010	1.7790e+000	6.5823e+004
Zr-95	2.7820e+000	1.0293e+011	3.4200e+000	1.2654e+005
Zr-97	2.6437e+000	9.7816e+010	3.2500e+000	1.2025e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.340e+08	0.000e+00	1.474e-26	0.000e+00	1.264e-27
0.02	2.353e+11	0.000e+00	4.073e-23	0.000e+00	1.411e-24
[illegible]3	2.852e+13	1.194e-193	1.092e-20	1.184e-195	1.082e-22
0.04	7.776e+11	9.623e-95	7.893e-22	4.256e-97	3.491e-24
0.05	2.693e+12	3.210e-58	8.935e-21	8.550e-61	2.380e-23

DOS File: 1CS1.MS5
Run Date: August 28, 2005
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Duration: 00:00:36

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	9.326e+11	1.382e-42	2.221e-20	2.745e-45	4.412e-23
0.08	3.552e+12	1.226e-28	2.013e-19	1.940e-31	3.185e-22
0.1	3.096e+12	2.493e-23	8.108e-19	3.813e-26	1.241e-21
0.15	1.025e+13	1.996e-17	2.108e-14	3.286e-20	3.471e-17
0.2	2.835e+13	1.864e-14	2.464e-11	3.290e-17	4.349e-14
0.3	2.701e+13	1.662e-11	1.471e-08	3.153e-14	2.790e-11
0.4	1.243e+14	6.364e-09	3.265e-06	1.240e-11	6.362e-09
0.5	2.772e+14	3.706e-07	1.187e-04	7.274e-10	2.330e-07
0.6	2.844e+14	4.901e-06	1.049e-03	9.567e-09	2.047e-06
0.8	4.203e+14	3.425e-04	3.955e-02	6.515e-07	7.523e-05
1.0	1.923e+14	2.668e-03	1.915e-01	4.918e-06	3.529e-04
1.5	1.617e+14	2.565e-01	8.487e+00	4.315e-04	1.428e-02
2.0	3.704e+13	1.104e+00	2.317e+01	1.707e-03	3.583e-02
3.0	2.222e+10	2.169e-02	2.596e-01	2.943e-05	3.522e-04
4.0	1.564e+09	1.168e-02	9.972e-02	1.445e-05	1.234e-04
TOTALS:	1.603e+15	1.397e+00	3.225e+01	2.188e-03	5.102e-02

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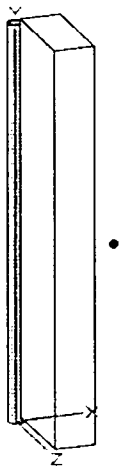
Pennsylvania Power & Light Co.

Page : 1
DOS File: 1CS2.MS5
Date: August 28, 2005
Time: 2:13:17 PM
Duration: 00:00:36

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

Case Title: Control Room
Description: 14 inch core spray - Time = 2 hour
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

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	X	Y	Z
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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Am-241	1.1055e-003	4.0902e+007	1.3590e-003	5.0283e+001
Ba-137m	8.8956e+002	3.2914e+013	1.0936e+003	4.0462e+007
Ba-139	3.1041e+002	1.1485e+013	3.8160e+002	1.4119e+007
Ba-140	8.4842e+002	3.1391e+013	1.0430e+003	3.8591e+007
Ce-141	1.9539e+001	7.2294e+011	2.4020e+001	8.8874e+005
Ce-143	1.7399e+001	6.4378e+011	2.1390e+001	7.9143e+005
Ce-144	1.6431e+001	6.0796e+011	2.0200e+001	7.4740e+005
Cm-242	2.8918e-001	1.0700e+010	3.5550e-001	1.3153e+004
Cm-244	1.6952e-002	6.2723e+008	2.0840e-002	7.7108e+002
Co-58	3.2188e-001	1.1909e+010	3.9570e-001	1.4641e+004
Co-60	1.7334e-001	6.4137e+009	2.1310e-001	7.8847e+003
Cs-134	1.2486e+003	4.6199e+013	1.5350e+003	5.6795e+007
Cs-136	3.9704e+002	1.4690e+013	4.8810e+002	1.8060e+007
Cs-137	9.4034e+002	3.4792e+013	1.1560e+003	4.2772e+007
I-131	6.9224e+003	2.5613e+014	8.5100e+003	3.1487e+008
I-132	8.0750e+003	2.9878e+014	9.9270e+003	3.6730e+008
I-133	1.3552e+004	5.0142e+014	1.6660e+004	6.1642e+008
I-134	3.2887e+003	1.2168e+014	4.0430e+003	1.4959e+008
I-135	1.1152e+004	4.1263e+014	1.3710e+004	5.0727e+008
La-140	2.0547e+001	7.6026e+011	2.5260e+001	9.3462e+005
La-141	5.4338e+000	2.0105e+011	6.6800e+000	2.4716e+005
La-142	3.0821e+000	1.1404e+011	3.7890e+000	1.4019e+005
Mo-99	1.0754e+002	3.9789e+012	1.3220e+002	4.8914e+006
Nb-95	8.3459e+000	3.0880e+011	1.0260e+001	3.7962e+005

DOS File: 1CS2.MS5
Run Date: August 28, 2005
Run Time: 2:13:17 PM
Duration: 00:00:36

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	3.1391e+000	1.1615e+011	3.8590e+000	1.4278e+005
Np-239	2.2500e+002	8.3249e+012	2.7660e+002	1.0234e+007
Pr-143	7.0143e+000	2.5953e+011	8.6230e+000	3.1905e+005
Pr-144	1.6197e+001	5.9927e+011	1.9911e+001	7.3671e+005
Pu-238	4.9530e-002	1.8326e+009	6.0890e-002	2.2529e+003
Pu-239	5.2613e-002	1.9467e+009	6.4680e-002	2.3932e+003
Pu-240	8.4598e-003	3.1301e+008	1.0400e-002	3.8480e+002
Pu-241	2.0865e+000	7.7199e+010	2.5650e+000	9.4905e+004
Rb-86	1.1754e+001	4.3491e+011	1.4450e+001	5.3465e+005
Rh-103m	9.3218e+001	3.4491e+012	1.1460e+002	4.2401e+006
Rh-105	6.0089e+001	2.2233e+012	7.3870e+001	2.7332e+006
Rh-106	3.7256e+001	1.3785e+012	4.5800e+001	1.6946e+006
Ru-103	9.3464e+001	3.4582e+012	1.1490e+002	4.2513e+006
Ru-105	4.7310e+001	1.7505e+012	5.8160e+001	2.1519e+006
Ru-106	3.7256e+001	1.3785e+012	4.5800e+001	1.6946e+006
Sb-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Sb-129	2.7380e+002	1.0131e+013	3.3660e+002	1.2454e+007
Sr-89	4.4658e+002	1.6523e+013	5.4900e+002	2.0313e+007
Sr-90	5.6981e+001	2.1083e+012	7.0050e+001	2.5919e+006
Sr-91	4.9246e+002	1.8221e+013	6.0540e+002	2.2400e+007
Sr-92	3.6263e+002	1.3417e+013	4.4580e+002	1.6495e+007
Tc-99m	9.7043e+001	3.5906e+012	1.1930e+002	4.4141e+006
Te-127	1.0111e+002	3.7411e+012	1.2430e+002	4.5991e+006
Te-127m	1.7269e+001	6.3896e+011	2.1230e+001	7.8551e+005
Te-129	3.1496e+002	1.1654e+013	3.8720e+002	1.4326e+007
Te-129m	7.2323e+001	2.6759e+012	8.8910e+001	3.2897e+006
Te-131m	2.2313e+002	8.2557e+012	2.7430e+002	1.0149e+007
Te-132	1.6448e+003	6.0857e+013	2.0220e+003	7.4814e+007
Y-90	1.0770e+000	3.9849e+010	1.3240e+000	4.8988e+004
Y-91	5.9015e+000	2.1836e+011	7.2550e+000	2.6844e+005
Y-92	6.4221e+001	2.3762e+012	7.8950e+001	2.9212e+006
Y-93	4.0501e+000	1.4985e+011	4.9790e+000	1.8422e+005
Zr-95	8.3378e+000	3.0850e+011	1.0250e+001	3.7925e+005
Zr-97	7.6073e+000	2.8147e+011	9.3520e+000	3.4602e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.918e+08	0.000e+00	4.310e-26	0.000e+00	3.697e-27
0.02	7.018e+11	0.000e+00	1.215e-22	0.000e+00	4.208e-24
[illegible]3	7.299e+13	3.056e-193	2.794e-20	3.029e-195	2.769e-22
0.04	1.870e+12	2.314e-94	1.898e-21	1.023e-96	8.393e-24
0.05	8.001e+12	9.537e-58	2.655e-20	2.541e-60	7.072e-23

DOS File: 1CS2.MS5
Run Date: August 28, 2005
Run Time: 2:13:17 PM
Duration: 00:00:36

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.055e+12	3.045e-42	4.895e-20	6.048e-45	9.722e-23
0.08	8.003e+12	2.762e-28	4.535e-19	4.370e-31	7.177e-22
0.1	9.141e+12	7.360e-23	2.394e-18	1.126e-25	3.663e-21
0.15	1.696e+13	3.301e-17	3.487e-14	5.436e-20	5.741e-17
0.2	7.218e+13	4.747e-14	6.275e-11	8.378e-17	1.107e-13
0.3	5.826e+13	3.584e-11	3.171e-08	6.799e-14	6.016e-11
0.4	2.577e+14	1.320e-08	6.772e-06	2.572e-11	1.320e-08
0.5	5.813e+14	7.773e-07	2.489e-04	1.526e-09	4.886e-07
0.6	5.442e+14	9.380e-06	2.007e-03	1.831e-08	3.918e-06
0.8	6.522e+14	5.315e-04	6.138e-02	1.011e-06	1.167e-04
1.0	3.489e+14	4.841e-03	3.474e-01	8.923e-06	6.403e-04
1.5	3.149e+14	4.993e-01	1.652e+01	8.401e-04	2.780e-02
2.0	6.555e+13	1.953e+00	4.101e+01	3.021e-03	6.341e-02
3.0	5.832e+10	5.692e-02	6.813e-01	7.722e-05	9.243e-04
4.0	2.994e+09	2.235e-02	1.908e-01	2.765e-05	2.361e-04
TOTALS:	3.015e+15	2.537e+00	5.881e+01	3.976e-03	9.314e-02

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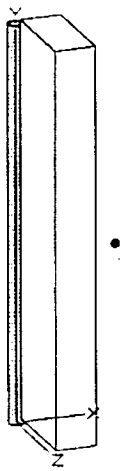
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
DOS File: 1CS4.MS5
Date: August 28, 2005
Time: 2:15:30 PM
Duration: 00:00:41

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

Case Title: Control Room
Description: 14 inch core spray - Time = 4 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.1030e-003	4.0812e+007	1.3560e-003	5.0172e+001
Ba-137m	8.8725e+002	3.2828e+013	1.0907e+003	4.0357e+007
Ba-139	1.1323e+002	4.1895e+012	1.3920e+002	5.1504e+006
Ba-140	8.4272e+002	3.1181e+013	1.0360e+003	3.8332e+007
Ce-141	1.9466e+001	7.2023e+011	2.3930e+001	8.8541e+005
Ce-143	1.6643e+001	6.1579e+011	2.0460e+001	7.5702e+005
Ce-144	1.6391e+001	6.0646e+011	2.0150e+001	7.4555e+005
Cm-242	2.8836e-001	1.0669e+010	3.5450e-001	1.3117e+004
Cm-244	1.6911e-002	6.2572e+008	2.0790e-002	7.6923e+002
Co-58	3.2090e-001	1.1873e+010	3.9450e-001	1.4597e+004
Co-60	1.7294e-001	6.3987e+009	2.1260e-001	7.8662e+003
Cs-134	1.2454e+003	4.6079e+013	1.5310e+003	5.6647e+007
Cs-136	3.9427e+002	1.4588e+013	4.8470e+002	1.7934e+007
Cs-137	9.3790e+002	3.4702e+013	1.1530e+003	4.2661e+007
I-131	6.8573e+003	2.5372e+014	8.4300e+003	3.1191e+008
I-132	5.1556e+003	1.9076e+014	6.3380e+003	2.3451e+008
I-133	1.2649e+004	4.6801e+014	1.5550e+004	5.7535e+008
I-134	6.7483e+002	2.4969e+013	8.2960e+002	3.0695e+007
I-135	9.0210e+003	3.3378e+014	1.1090e+004	4.1033e+008
La-140	4.8392e+001	1.7905e+012	5.9490e+001	2.2011e+006
La-141	3.8093e+000	1.4095e+011	4.6830e+000	1.7327e+005
La-142	1.2511e+000	4.6290e+010	1.5380e+000	5.6906e+004
Mo-99	1.0502e+002	3.8856e+012	1.2910e+002	4.7767e+006
Nb-95	8.3215e+000	3.0790e+011	1.0230e+001	3.7851e+005

DOS File: 1CS4.MS5
Run Date: August 28, 2005
Run Time: 2:15:30 PM
Duration: 00:00:41

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	3.1155e+000	1.1527e+011	3.8300e+000	1.4171e+005
Np-239	2.1898e+002	8.1022e+012	2.6920e+002	9.9604e+006
Pr-143	7.0395e+000	2.6046e+011	8.6540e+000	3.2020e+005
Pr-144	1.6156e+001	5.9779e+011	1.9862e+001	7.3489e+005
Pu-238	4.9408e-002	1.8281e+009	6.0740e-002	2.2474e+003
Pu-239	5.2499e-003	1.9425e+008	6.4540e-003	2.3880e+002
Pu-240	8.4354e-003	3.1211e+008	1.0370e-002	3.8369e+002
Pu-241	2.0816e+000	7.7019e+010	2.5590e+000	9.4683e+004
Rb-86	1.1689e+001	4.3250e+011	1.4370e+001	5.3169e+005
Rh-103m	9.2813e+001	3.4341e+012	1.1410e+002	4.2217e+006
Rh-105	5.9194e+001	2.1902e+012	7.2770e+001	2.6925e+006
Rh-106	3.7158e+001	1.3748e+012	4.5680e+001	1.6902e+006
Ru-103	9.3057e+001	3.4431e+012	1.1440e+002	4.2328e+006
Ru-105	3.4539e+001	1.2779e+012	4.2460e+001	1.5710e+006
Ru-106	3.7158e+001	1.3748e+012	4.5680e+001	1.6902e+006
Sb-127	9.8833e+001	3.6568e+012	1.2150e+002	4.4955e+006
Sb-129	1.9815e+002	7.3317e+012	2.4360e+002	9.0132e+006
Sr-89	4.4503e+002	1.6466e+013	5.4710e+002	2.0243e+007
Sr-90	5.6843e+001	2.1032e+012	6.9880e+001	2.5856e+006
Sr-91	4.2453e+002	1.5708e+013	5.2190e+002	1.9310e+007
Sr-92	2.1694e+002	8.0269e+012	2.6670e+002	9.8679e+006
Tc-99m	9.6230e+001	3.5605e+012	1.1830e+002	4.3771e+006
Te-127	1.0062e+002	3.7230e+012	1.2370e+002	4.5769e+006
Te-127m	1.7229e+001	6.3746e+011	2.1180e+001	7.8366e+005
Te-129	2.5404e+002	9.3994e+012	3.1230e+002	1.1555e+007
Te-129m	7.2111e+001	2.6681e+012	8.8650e+001	3.2800e+006
Te-131m	2.1247e+002	7.8614e+012	2.6120e+002	9.6644e+006
Te-132	1.6122e+003	5.9653e+013	1.9820e+003	7.3334e+007
Y-90	2.2695e+000	8.3971e+010	2.7900e+000	1.0323e+005
Y-91	6.0707e+000	2.2462e+011	7.4630e+000	2.7613e+005
Y-92	1.3446e+002	4.9751e+012	1.6530e+002	6.1161e+006
Y-93	3.5222e+000	1.3032e+011	4.3300e+000	1.6021e+005
Zr-95	8.3134e+000	3.0759e+011	1.0220e+001	3.7814e+005
Zr-97	6.9915e+000	2.5869e+011	8.5950e+000	3.1802e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.729e+08	0.000e+00	4.102e-26	0.000e+00	3.518e-27
0.02	6.925e+11	0.000e+00	1.199e-22	0.000e+00	4.152e-24
[illegible]3	6.891e+13	2.885e-193	2.638e-20	2.860e-195	2.614e-22
0.04	1.802e+12	2.230e-94	1.829e-21	9.862e-97	8.090e-24
0.05	7.843e+12	9.348e-58	2.602e-20	2.490e-60	6.933e-23

DOS File: 1CS4.MS5
Run Date: August 28, 2005
Run Time: 2:15:30 PM
Duration: 00:00:41

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.036e+12	3.016e-42	4.848e-20	5.991e-45	9.630e-23
0.08	7.915e+12	2.731e-28	4.485e-19	4.322e-31	7.098e-22
0.1	8.893e+12	7.161e-23	2.329e-18	1.096e-25	3.564e-21
0.15	1.069e+13	2.081e-17	2.198e-14	3.427e-20	3.620e-17
0.2	6.619e+13	4.354e-14	5.755e-11	7.684e-17	1.016e-13
0.3	5.156e+13	3.172e-11	2.807e-08	6.017e-14	5.324e-11
0.4	2.365e+14	1.211e-08	6.215e-06	2.360e-11	1.211e-08
0.5	5.068e+14	6.776e-07	2.170e-04	1.330e-09	4.260e-07
0.6	3.712e+14	6.398e-06	1.369e-03	1.249e-08	2.672e-06
0.8	3.682e+14	3.001e-04	3.465e-02	5.707e-07	6.591e-05
1.0	2.442e+14	3.387e-03	2.431e-01	6.244e-06	4.481e-04
1.5	2.374e+14	3.765e-01	1.246e+01	6.335e-04	2.096e-02
2.0	4.550e+13	1.356e+00	2.846e+01	2.097e-03	4.401e-02
3.0	7.644e+10	7.460e-02	8.929e-01	1.012e-04	1.211e-03
4.0	1.215e+09	9.072e-03	7.746e-02	1.122e-05	9.582e-05
TOTALS:	2.236e+15	1.820e+00	4.217e+01	2.849e-03	6.680e-02

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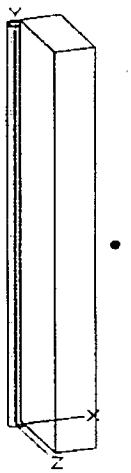
Page : 1
DOS File: 1CS8.MS5
Run Date: August 28, 2005
Run Time: 2:18:25 PM
Duration: 00:00:41

EC-RADN-1129
Page 422

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

Case Title: Control Room
Description: 14 inch core spray - Time = 8 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.0990e-003	4.0661e+007	1.3510e-003	4.9987e+001
Ba-137m	8.8263e+002	3.2657e+013	1.0851e+003	4.0147e+007
Ba-139	1.5081e+001	5.5800e+011	1.8540e+001	6.8598e+005
Ba-140	8.3052e+002	3.0729e+013	1.0210e+003	3.7777e+007
Ce-141	1.9311e+001	7.1451e+011	2.3740e+001	8.7838e+005
Ce-143	1.5228e+001	5.6342e+011	1.8720e+001	6.9264e+005
Ce-144	1.6301e+001	6.0315e+011	2.0040e+001	7.4148e+005
Cm-242	2.8682e-001	1.0612e+010	3.5260e-001	1.3046e+004
Cm-244	1.6830e-002	6.2271e+008	2.0690e-002	7.6553e+002
Co-58	3.1879e-001	1.1795e+010	3.9190e-001	1.4500e+004
Co-60	1.7204e-001	6.3656e+009	2.1150e-001	7.8255e+003
Cs-134	1.2397e+003	4.5868e+013	1.5240e+003	5.6388e+007
Cs-136	3.8899e+002	1.4393e+013	4.7820e+002	1.7693e+007
Cs-137	9.3302e+002	3.4522e+013	1.1470e+003	4.2439e+007
I-131	6.7288e+003	2.4896e+014	8.2720e+003	3.0606e+008
I-132	2.6534e+003	9.8177e+013	3.2620e+003	1.2069e+008
I-133	1.1014e+004	4.0752e+014	1.3540e+004	5.0098e+008
I-134	2.8413e+001	1.0513e+012	3.4930e+001	1.2924e+006
I-135	5.8999e+003	2.1830e+014	7.2530e+003	2.6836e+008
La-140	1.0054e+002	3.7200e+012	1.2360e+002	4.5732e+006
La-141	1.8725e+000	6.9284e+010	2.3020e+000	8.5174e+004
La-142	2.0613e-001	7.6266e+009	2.5340e-001	9.3758e+003
Mo-99	1.0022e+002	3.7080e+012	1.2320e+002	4.5584e+006
Nb-95	8.2808e+000	3.0639e+011	1.0180e+001	3.7666e+005

DOS File: 1CS8.MS5
Run Date: August 28, 2005
Run Time: 2:18:25 PM
Duration: 00:00:41

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	3.0675e+000	1.1350e+011	3.7710e+000	1.3953e+005
Np-239	2.0751e+002	7.6778e+012	2.5510e+002	9.4387e+006
Pr-143	7.0810e+000	2.6200e+011	8.7050e+000	3.2209e+005
Pr-144	1.6068e+001	5.9452e+011	1.9753e+001	7.3088e+005
Pu-238	4.9172e-002	1.8194e+009	6.0450e-002	2.2367e+003
Pu-239	5.2272e-003	1.9341e+008	6.4260e-003	2.3776e+002
Pu-240	8.3947e-003	3.1060e+008	1.0320e-002	3.8184e+002
Pu-241	2.0710e+000	7.6628e+010	2.5460e+000	9.4202e+004
Rb-86	1.1559e+001	4.2768e+011	1.4210e+001	5.2577e+005
Rh-103m	9.2083e+001	3.4071e+012	1.1320e+002	4.1885e+006
Rh-105	5.6388e+001	2.0863e+012	6.9320e+001	2.5648e+006
Rh-106	3.6963e+001	1.3676e+012	4.5440e+001	1.6813e+006
Ru-103	9.2325e+001	3.4160e+012	1.1350e+002	4.1995e+006
Ru-105	1.8408e+001	6.8110e+011	2.2630e+001	8.3731e+005
Ru-106	3.6963e+001	1.3676e+012	4.5440e+001	1.6813e+006
Sb-127	9.5498e+001	3.5334e+012	1.1740e+002	4.3438e+006
Sb-129	1.0379e+002	3.8404e+012	1.2760e+002	4.7212e+006
Sr-89	4.4186e+002	1.6349e+013	5.4320e+002	2.0098e+007
Sr-90	5.6567e+001	2.0930e+012	6.9540e+001	2.5730e+006
Sr-91	3.1553e+002	1.1675e+013	3.8790e+002	1.4352e+007
Sr-92	7.7602e+001	2.8713e+012	9.5400e+001	3.5298e+006
Tc-99m	9.3790e+001	3.4702e+012	1.1530e+002	4.2661e+006
Te-127	9.9240e+001	3.6719e+012	1.2200e+002	4.5140e+006
Te-127m	1.7147e+001	6.3445e+011	2.1080e+001	7.7996e+005
Te-129	1.5976e+002	5.9111e+012	1.9640e+002	7.2668e+006
Te-129m	7.1623e+001	2.6501e+012	8.8050e+001	3.2578e+006
Te-131m	1.9279e+002	7.1331e+012	2.3700e+002	8.7690e+006
Te-132	1.5488e+003	5.7305e+013	1.9040e+003	7.0448e+007
Y-90	4.5626e+000	1.6882e+011	5.6090e+000	2.0753e+005
Y-91	6.3326e+000	2.3431e+011	7.7850e+000	2.8805e+005
Y-92	1.3048e+002	4.8276e+012	1.6040e+002	5.9348e+006
Y-93	2.6640e+000	9.8569e+010	3.2750e+000	1.2117e+005
Zr-95	8.2564e-002	3.0549e+009	1.0150e-001	3.7555e+003
Zr-97	5.9048e+000	2.1848e+011	7.2590e+000	2.6858e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.422e+08	0.000e+00	3.764e-26	0.000e+00	3.229e-27
0.02	6.742e+11	0.000e+00	1.167e-22	0.000e+00	4.042e-24
[illegible]	6.472e+13	2.710e-193	2.477e-20	2.686e-195	2.455e-22
0.04	1.738e+12	2.151e-94	1.764e-21	9.513e-97	7.803e-24
0.05	7.534e+12	8.981e-58	2.500e-20	2.392e-60	6.660e-23

DOS File: 1CS8.MS5
Run Date: August 28, 2005
Run Time: 2:18:25 PM
Duration: 00:00:41

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.999e+12	2.961e-42	4.760e-20	5.882e-45	9.455e-23
0.08	7.745e+12	2.673e-28	4.389e-19	4.229e-31	6.945e-22
0.1	8.428e+12	6.786e-23	2.208e-18	1.038e-25	3.377e-21
0.15	8.493e+12	1.653e-17	1.746e-14	2.723e-20	2.876e-17
0.2	6.050e+13	3.979e-14	5.260e-11	7.023e-17	9.284e-14
0.3	4.401e+13	2.708e-11	2.396e-08	5.136e-14	4.545e-11
0.4	2.208e+14	1.131e-08	5.802e-06	2.204e-11	1.131e-08
0.5	4.188e+14	5.600e-07	1.793e-04	1.099e-09	3.520e-07
0.6	2.411e+14	4.156e-06	8.894e-04	8.113e-09	1.736e-06
0.8	2.206e+14	1.797e-04	2.076e-02	3.419e-07	3.948e-05
1.0	1.548e+14	2.148e-03	1.541e-01	3.959e-06	2.841e-04
1.5	1.524e+14	2.417e-01	7.999e+00	4.067e-04	1.346e-02
2.0	2.774e+13	8.268e-01	1.736e+01	1.278e-03	2.684e-02
3.0	1.346e+11	1.313e-01	1.572e+00	1.782e-04	2.132e-03
4.0	2.002e+08	1.495e-03	1.276e-02	1.849e-06	1.579e-05
TOTALS:	1.642e+15	1.204e+00	2.712e+01	1.869e-03	4.277e-02

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

Page : 1
DOS File: 1CS16.MS5
Run Date: August 28, 2005
Run Time: 2:12:11 PM
Duration: 00:00:36

EC-RADN-1129
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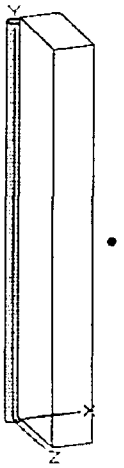
File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 14 inch core spray - Time = 16 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.0916e-003	4.0391e+007	1.3420e-003	4.9654e+001
Ba-137m	8.7417e+002	3.2344e+013	1.0747e+003	3.9762e+007
Ba-139	2.6721e-001	9.8870e+009	3.2850e-001	1.2155e+004
Ba-140	8.0791e+002	2.9893e+013	9.9320e+002	3.6748e+007
Ce-141	1.8994e+001	7.0277e+011	2.3350e+001	8.6395e+005
Ce-143	1.2747e+001	4.7162e+011	1.5670e+001	5.7979e+005
Ce-144	1.6131e+001	5.9683e+011	1.9830e+001	7.3371e+005
Cm-242	2.8365e-001	1.0495e+010	3.4870e-001	1.2902e+004
Cm-244	1.6667e-002	6.1669e+008	2.0490e-002	7.5813e+002
Co-58	3.1472e-001	1.1645e+010	3.8690e-001	1.4315e+004
Co-60	1.7042e-001	6.3054e+009	2.0950e-001	7.7515e+003
Cs-134	1.2275e+003	4.5417e+013	1.5090e+003	5.5833e+007
Cs-136	3.7849e+002	1.4004e+013	4.6530e+002	1.7216e+007
Cs-137	9.2407e+002	3.4190e+013	1.1360e+003	4.2032e+007
I-131	6.4790e+003	2.3972e+014	7.9650e+003	2.9470e+008
I-132	1.7123e+003	6.3355e+013	2.1050e+003	7.7885e+007
I-133	8.3540e+003	3.0910e+014	1.0270e+004	3.7999e+008
I-134	5.0384e-002	1.8642e+009	6.1940e-002	2.2918e+003
I-135	2.5249e+003	9.3422e+013	3.1040e+003	1.1485e+008
La-140	1.9197e+002	7.1030e+012	2.3600e+002	8.7320e+006
La-141	4.5219e-001	1.6731e+010	5.5590e-001	2.0568e+004
La-142	5.5948e-003	2.0701e+008	6.8780e-003	2.5449e+002
Mo-99	9.1268e+001	3.3769e+012	1.1220e+002	4.1514e+006
Nb-95	8.2076e+000	3.0368e+011	1.0090e+001	3.7333e+005

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DOS File: 1CS16.MS5
Run Date: August 28, 2005
Run Time: 2:12:11 PM
Duration: 00:00:36

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.9747e+000	1.1007e+011	3.6570e+000	1.3531e+005
Np-239	1.8628e+002	6.8923e+012	2.2900e+002	8.4730e+006
Pr-143	7.1282e+000	2.6374e+011	8.7630e+000	3.2423e+005
Pr-144	1.5900e+001	5.8829e+011	1.9546e+001	7.2322e+005
Pu-238	4.8701e-002	1.8019e+009	5.9870e-002	2.2152e+003
Pu-239	5.1824e-003	1.9175e+008	6.3710e-003	2.3573e+002
Pu-240	8.3134e-003	3.0759e+008	1.0220e-002	3.7814e+002
Pu-241	2.0507e+000	7.5875e+010	2.5210e+000	9.3277e+004
Rb-86	1.1307e+001	4.1835e+011	1.3900e+001	5.1430e+005
Rh-103m	9.0703e+001	3.3560e+012	1.1151e+002	4.1257e+006
Rh-105	4.9229e+001	1.8215e+012	6.0520e+001	2.2392e+006
Rh-106	3.6580e+001	1.3535e+012	4.4970e+001	1.6639e+006
Ru-103	9.0943e+001	3.3649e+012	1.1180e+002	4.1366e+006
Ru-105	5.2288e+000	1.9347e+011	6.4280e+000	2.3784e+005
Ru-106	3.6580e+001	1.3535e+012	4.4970e+001	1.6639e+006
Sb-127	8.9072e+001	3.2957e+012	1.0950e+002	4.0515e+006
Sb-129	2.8479e+001	1.0537e+012	3.5010e+001	1.2954e+006
Sr-89	4.3552e+002	1.6114e+013	5.3540e+002	1.9810e+007
Sr-90	5.6022e+001	2.0728e+012	6.8870e+001	2.5482e+006
Sr-91	1.7432e+002	6.4498e+012	2.1430e+002	7.9291e+006
Sr-92	9.9321e+000	3.6749e+011	1.2210e+001	4.5177e+005
Tc-99m	8.8665e+001	3.2806e+012	1.0900e+002	4.0330e+006
Te-127	9.6067e+001	3.5545e+012	1.1810e+002	4.3697e+006
Te-127m	1.6976e+001	6.2813e+011	2.0870e+001	7.7219e+005
Te-129	9.6637e+001	3.5756e+012	1.1880e+002	4.3956e+006
Te-129m	7.0533e+001	2.6097e+012	8.6710e+001	3.2083e+006
Te-131m	1.5870e+002	5.8720e+012	1.9510e+002	7.2187e+006
Te-132	1.4284e+003	5.2851e+013	1.7560e+003	6.4972e+007
Y-90	8.8014e+000	3.2565e+011	1.0820e+001	4.0034e+005
Y-91	6.6385e+000	2.4562e+011	8.1610e+000	3.0196e+005
Y-92	4.7790e+001	1.7682e+012	5.8750e+001	2.1738e+006
Y-93	1.5236e+000	5.6372e+010	1.8730e+000	6.9301e+004
Zr-95	8.1425e+000	3.0127e+011	1.0010e+001	3.7037e+005
Zr-97	4.2120e+000	1.5584e+011	5.1780e+000	1.9159e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.008e+08	0.000e+00	3.309e-26	0.000e+00	2.838e-27
0.02	6.417e+11	0.000e+00	1.111e-22	0.000e+00	3.848e-24
[illegible]3	5.949e+13	2.491e-193	2.277e-20	2.469e-195	2.257e-22
0.04	1.660e+12	2.055e-94	1.685e-21	9.088e-97	7.454e-24
0.05	6.949e+12	8.283e-58	2.306e-20	2.207e-60	6.143e-23

DOS File: 1CS16.MS5
Run Date: August 28, 2005
Run Time: 2:12:11 PM
Duration: 00:00:36

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.927e+12	2.856e-42	4.590e-20	5.672e-45	9.118e-23
0.08	7.422e+12	2.561e-28	4.206e-19	4.053e-31	6.655e-22
0.1	7.583e+12	6.106e-23	1.986e-18	9.341e-26	3.039e-21
0.15	7.899e+12	1.538e-17	1.624e-14	2.532e-20	2.675e-17
0.2	5.343e+13	3.514e-14	4.645e-11	6.203e-17	8.199e-14
0.3	3.720e+13	2.288e-11	2.025e-08	4.341e-14	3.841e-11
0.4	2.051e+14	1.050e-08	5.389e-06	2.047e-11	1.050e-08
0.5	3.139e+14	4.198e-07	1.344e-04	8.240e-10	2.639e-07
0.6	1.912e+14	3.295e-06	7.052e-04	6.432e-09	1.376e-06
0.8	1.644e+14	1.340e-04	1.547e-02	2.549e-07	2.943e-05
1.0	8.581e+13	1.191e-03	8.543e-02	2.195e-06	1.575e-04
1.5	7.709e+13	1.222e-01	4.045e+00	2.056e-04	6.806e-03
2.0	1.269e+13	3.783e-01	7.941e+00	5.850e-04	1.228e-02
3.0	2.530e+11	2.469e-01	2.955e+00	3.350e-04	4.009e-03
4.0	5.434e+06	4.057e-05	3.464e-04	5.019e-08	4.285e-07
TOTALS:	1.235e+15	7.488e-01	1.504e+01	1.128e-03	2.328e-02

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

Page : 1
DOS File: 1CS24.MS5
Run Date: August 28, 2005
Run Time: 2:13:54 PM
Duration: 00:00:39

EC-RADN-1129
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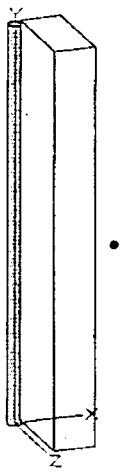
File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 14 inch core spray - Time = 24 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.0843e-003	4.0120e+007	1.3330e-003	4.9321e+001
Ba-137m	8.6570e+002	3.2031e+013	1.0643e+003	3.9377e+007
Ba-139	4.7367e-003	1.7526e+008	5.8230e-003	2.1545e+002
Ba-140	7.8570e+002	2.9071e+013	9.6590e+002	3.5738e+007
Ce-141	1.8677e+001	6.9103e+011	2.2960e+001	8.4952e+005
Ce-143	1.0672e+001	3.9488e+011	1.3120e+001	4.8544e+005
Ce-144	1.5968e+001	5.9081e+011	1.9630e+001	7.2631e+005
Cm-242	2.8047e-001	1.0378e+010	3.4480e-001	1.2758e+004
Cm-244	1.6505e-002	6.1067e+008	2.0290e-002	7.5073e+002
Co-58	3.1065e-001	1.1494e+010	3.8190e-001	1.4130e+004
Co-60	1.6871e-001	6.2422e+009	2.0740e-001	7.6738e+003
Cs-134	1.2145e+003	4.4935e+013	1.4930e+003	5.5241e+007
Cs-136	3.6824e+002	1.3625e+013	4.5270e+002	1.6750e+007
Cs-137	9.1512e+002	3.3859e+013	1.1250e+003	4.1625e+007
I-131	6.2383e+003	2.3082e+014	7.6690e+003	2.8375e+008
I-132	1.5740e+003	5.8238e+013	1.9350e+003	7.1595e+007
I-133	6.3399e+003	2.3458e+014	7.7940e+003	2.8838e+008
I-134	8.9316e-005	3.3047e+006	1.0980e-004	4.0626e+000
I-135	1.0811e+003	3.9999e+013	1.3290e+003	4.9173e+007
La-140	2.6852e+002	9.9351e+012	3.3010e+002	1.2214e+007
La-141	1.0924e-001	4.0421e+009	1.3430e-001	4.9691e+003
La-142	1.5187e-004	5.6192e+006	1.8670e-004	6.9079e+000
Mo-99	8.3052e+001	3.0729e+012	1.0210e+002	3.7777e+006
Nb-95	8.1230e+000	3.0055e+011	9.9860e+000	3.6948e+005

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.8845e+000	1.0672e+011	3.5460e+000	1.3120e+005
Np-239	1.6724e+002	6.1880e+012	2.0560e+002	7.6072e+006
Pr-143	7.1371e+000	2.6407e+011	8.7740e+000	3.2464e+005
Pr-144	1.5739e+001	5.8236e+011	1.9349e+001	7.1592e+005
Pu-238	4.8229e-002	1.7845e+009	5.9290e-002	2.1937e+003
Pu-239	5.1369e-003	1.9006e+008	6.3150e-003	2.3366e+002
Pu-240	8.2401e-003	3.0489e+008	1.0130e-002	3.7481e+002
Pu-241	2.0312e+000	7.5153e+010	2.4970e+000	9.2389e+004
Rb-86	1.1055e+001	4.0902e+011	1.3590e+001	5.0283e+005
Rh-103m	8.9324e+001	3.3050e+012	1.0981e+002	4.0630e+006
Rh-105	4.2104e+001	1.5578e+012	5.1760e+001	1.9151e+006
Rh-106	3.6206e+001	1.3396e+012	4.4510e+001	1.6469e+006
Ru-103	8.9560e+001	3.3137e+012	1.1010e+002	4.0737e+006
Ru-105	1.4853e+000	5.4958e+010	1.8260e+000	6.7562e+004
Ru-106	3.6206e+001	1.3396e+012	4.4510e+001	1.6469e+006
Sb-127	8.3052e+001	3.0729e+012	1.0210e+002	3.7777e+006
Sb-129	7.8131e+000	2.8908e+011	9.6050e+000	3.5539e+005
Sr-89	4.2933e+002	1.5885e+013	5.2780e+002	1.9529e+007
Sr-90	5.5477e+001	2.0526e+012	6.8200e+001	2.5234e+006
Sr-91	9.6311e+001	3.5635e+012	1.1840e+002	4.3808e+006
Sr-92	1.2706e+000	4.7012e+010	1.5620e+000	5.7794e+004
Tc-99m	8.3296e+001	3.0820e+012	1.0240e+002	3.7888e+006
Te-127	9.2732e+001	3.4311e+012	1.1400e+002	4.2180e+006
Te-127m	1.6814e+001	6.2211e+011	2.0670e+001	7.6479e+005
Te-129	7.0981e+001	2.6263e+012	8.7260e+001	3.2286e+006
Te-129m	6.9395e+001	2.5676e+012	8.5310e+001	3.1565e+006
Te-131m	1.3064e+002	4.8336e+012	1.6060e+002	5.9422e+006
Te-132	1.3178e+003	4.8758e+013	1.6200e+003	5.9940e+007
Y-90	1.2625e+001	4.6711e+011	1.5520e+001	5.7424e+005
Y-91	6.7654e+000	2.5032e+011	8.3170e+000	3.0773e+005
Y-92	1.2706e+001	4.7012e+011	1.5620e+001	5.7794e+005
Y-93	8.7119e-001	3.2234e+010	1.0710e+000	3.9627e+004
Zr-95	8.0376e+000	2.9739e+011	9.8810e+000	3.6560e+005
Zr-97	3.0048e+000	1.1118e+011	3.6940e+000	1.3668e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.758e+08	0.000e+00	3.034e-26	0.000e+00	2.603e-27
0.02	6.115e+11	0.000e+00	1.058e-22	0.000e+00	3.666e-24
[illegible]3	5.530e+13	2.316e-193	2.117e-20	2.295e-195	2.098e-22
[illegible].04	1.594e+12	1.973e-94	1.618e-21	8.726e-97	7.158e-24
0.05	6.412e+12	7.643e-58	2.128e-20	2.036e-60	5.668e-23

DOS File: 1CS24.MS5
Run Date: August 28, 2005
Run Time: 2:13:54 PM
Duration: 00:00:39

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.860e+12	2.756e-42	4.430e-20	5.474e-45	8.799e-23
0.08	7.119e+12	2.457e-28	4.034e-19	3.888e-31	6.384e-22
0.1	6.835e+12	5.503e-23	1.790e-18	8.420e-26	2.739e-21
0.15	7.535e+12	1.467e-17	1.549e-14	2.416e-20	2.551e-17
0.2	4.836e+13	3.180e-14	4.204e-11	5.613e-17	7.420e-14
0.3	3.396e+13	2.090e-11	1.849e-08	3.964e-14	3.507e-11
0.4	1.945e+14	9.960e-09	5.110e-06	1.941e-11	9.957e-09
0.5	2.432e+14	3.252e-07	1.042e-04	6.383e-10	2.044e-07
0.6	1.811e+14	3.121e-06	6.679e-04	6.092e-09	1.304e-06
0.8	1.473e+14	1.200e-04	1.386e-02	2.283e-07	2.637e-05
1.0	5.834e+13	8.094e-04	5.808e-02	1.492e-06	1.071e-04
1.5	4.764e+13	7.554e-02	2.500e+00	1.271e-04	4.206e-03
2.0	6.611e+12	1.970e-01	4.136e+00	3.047e-04	6.396e-03
3.0	3.538e+11	3.453e-01	4.132e+00	4.684e-04	5.606e-03
4.0	1.475e+05	1.101e-06	9.402e-06	1.362e-09	1.163e-08
TOTALS:	1.049e+15	6.187e-01	1.084e+01	9.019e-04	1.634e-02

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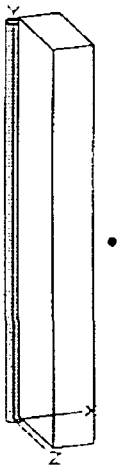
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
DOS File: 1CS48.MS5
Date: August 30, 2005
Time: 4:29:34 PM
Duration: 00:00:36

EC-RADN-1129
Page 431

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

Case Title: Control Room
Description: 14 inch core spray - Time = 48 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.0615e-003	3.9277e+007	1.3050e-003	4.8285e+001
Ba-137m	8.4108e+002	3.1120e+013	1.0340e+003	3.8257e+007
Ba-139	2.6372e-008	9.7575e+002	3.2420e-008	1.1995e-003
Ba-140	7.2274e+002	2.6741e+013	8.8850e+002	3.2875e+007
Ce-141	1.7757e+001	6.5702e+011	2.1830e+001	8.0771e+005
Ce-143	6.2610e+000	2.3166e+011	7.6970e+000	2.8479e+005
Ce-144	1.5472e+001	5.7245e+011	1.9020e+001	7.0374e+005
Cm-242	2.7128e-001	1.0037e+010	3.3350e-001	1.2339e+004
Cm-244	1.6033e-002	5.9322e+008	1.9710e-002	7.2927e+002
Co-58	2.9878e-001	1.1055e+010	3.6730e-001	1.3590e+004
Co-60	1.6383e-001	6.0616e+009	2.0140e-001	7.4518e+003
Cs-134	1.1787e+003	4.3611e+013	1.4490e+003	5.3613e+007
Cs-136	3.3920e+002	1.2551e+013	4.1700e+002	1.5429e+007
Cs-137	8.8909e+002	3.2896e+013	1.0930e+003	4.0441e+007
I-131	5.5647e+003	2.0590e+014	6.8410e+003	2.5312e+008
I-132	1.2348e+003	4.5688e+013	1.5180e+003	5.6166e+007
I-133	2.7673e+003	1.0239e+014	3.4020e+003	1.2587e+008
I-134	4.9799e-013	1.8426e-002	6.1220e-013	2.2651e-008
I-135	8.4760e+001	3.1361e+012	1.0420e+002	3.8554e+006
La-140	4.2559e+002	1.5747e+013	5.2320e+002	1.9358e+007
La-141	1.5390e-003	5.6944e+007	1.8920e-003	7.0004e+001
La-142	3.0374e-009	1.1238e+002	3.7340e-009	1.3816e-004
Mo-99	6.2716e+001	2.3205e+012	7.7100e+001	2.8527e+006
Nb-95	7.8855e+000	2.9176e+011	9.6940e+000	3.5868e+005

DOS File: 1CS48.MS5
Run Date: August 30, 2005
Run Time: 4:29:34 PM
Duration: 00:00:36

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.6307e+000	9.7335e+010	3.2340e+000	1.1966e+005
Np-239	1.2104e+002	4.4785e+012	1.4880e+002	5.5056e+006
Pr-143	6.9915e+000	2.5869e+011	8.5950e+000	3.1802e+005
Pr-144	1.5250e+001	5.6426e+011	1.8748e+001	6.9368e+005
Pu-238	4.6846e-002	1.7333e+009	5.7590e-002	2.1308e+003
Pu-239	5.0002e-003	1.8501e+008	6.1470e-003	2.2744e+002
Pu-240	8.0002e-003	2.9601e+008	9.8350e-003	3.6390e+002
Pu-241	1.9726e+000	7.2986e+010	2.4250e+000	8.9725e+004
Rb-86	1.0347e+001	3.8284e+011	1.2720e+001	4.7064e+005
Rh-103m	8.5187e+001	3.1519e+012	1.0472e+002	3.8748e+006
Rh-105	2.5672e+001	9.4987e+011	3.1560e+001	1.1677e+006
Rh-106	3.5100e+001	1.2987e+012	4.3150e+001	1.5965e+006
Ru-103	8.5411e+001	3.1602e+012	1.0500e+002	3.8850e+006
Ru-105	3.4034e-002	1.2593e+009	4.1840e-002	1.5481e+003
Ru-106	3.5100e+001	1.2987e+012	4.3150e+001	1.5965e+006
Sb-127	6.7377e+001	2.4930e+012	8.2830e+001	3.0647e+006
Sb-129	1.6131e-001	5.9683e+009	1.9830e-001	7.3371e+003
Sr-89	4.1136e+002	1.5220e+013	5.0570e+002	1.8711e+007
Sr-90	5.3874e+001	1.9933e+012	6.6230e+001	2.4505e+006
Sr-91	1.6236e+001	6.0074e+011	1.9960e+001	7.3852e+005
Sr-92	2.6640e-003	9.8569e+007	3.2750e-003	1.2117e+002
Tc-99m	6.4180e+001	2.3747e+012	7.8900e+001	2.9193e+006
Te-127	7.9880e+001	2.9556e+012	9.8200e+001	3.6334e+006
Te-127m	1.6309e+001	6.0345e+011	2.0050e+001	7.4185e+005
Te-129	5.7323e+001	2.1210e+012	7.0470e+001	2.6074e+006
Te-129m	6.6035e+001	2.4433e+012	8.1180e+001	3.0037e+006
Te-131m	7.2876e+001	2.6964e+012	8.9590e+001	3.3148e+006
Te-132	1.0347e+003	3.8284e+013	1.2720e+003	4.7064e+007
Y-90	2.1857e+001	8.0871e+011	2.6870e+001	9.9419e+005
Y-91	6.7117e+000	2.4833e+011	8.2510e+000	3.0529e+005
Y-92	1.4325e-001	5.3001e+009	1.7610e-001	6.5157e+003
Y-93	1.6301e-001	6.0315e+009	2.0040e-001	7.4148e+003
Zr-95	7.7228e+000	2.8574e+011	9.4940e+000	3.5128e+005
Zr-97	1.0908e+000	4.0360e+010	1.3410e+000	4.9617e+004

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.443e+08	0.000e+00	2.687e-26	0.000e+00	2.305e-27
0.02	5.204e+11	0.000e+00	9.008e-23	0.000e+00	3.120e-24
[illegible]	4.539e+13	1.901e-193	1.737e-20	1.884e-195	1.722e-22
[illegible]	1.434e+12	1.775e-94	1.456e-21	7.850e-97	6.439e-24
0.05	5.036e+12	6.003e-58	1.671e-20	1.599e-60	4.452e-23

DOS File: 1CS48.MS5
Run Date: August 30, 2005
Run Time: 4:29:34 PM
Duration: 00:00:36

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.680e+12	2.489e-42	4.000e-20	4.943e-45	7.946e-23
0.08	6.306e+12	2.176e-28	3.573e-19	3.444e-31	5.655e-22
0.1	5.032e+12	4.052e-23	1.318e-18	6.199e-26	2.017e-21
0.15	6.433e+12	1.252e-17	1.323e-14	2.062e-20	2.178e-17
0.2	3.750e+13	2.466e-14	3.260e-11	4.353e-17	5.754e-14
0.3	2.942e+13	1.810e-11	1.602e-08	3.434e-14	3.038e-11
0.4	1.712e+14	8.768e-09	4.498e-06	1.708e-11	8.765e-09
0.5	1.216e+14	1.626e-07	5.207e-05	3.191e-10	1.022e-07
0.6	1.579e+14	2.722e-06	5.825e-04	5.313e-09	1.137e-06
0.8	1.183e+14	9.637e-05	1.113e-02	1.833e-07	2.117e-05
1.0	3.376e+13	4.684e-04	3.361e-02	8.633e-07	6.195e-05
1.5	2.775e+13	4.400e-02	1.456e+00	7.402e-05	2.450e-03
2.0	2.097e+12	6.248e-02	1.312e+00	9.661e-05	2.028e-03
3.0	5.607e+11	5.472e-01	6.550e+00	7.424e-04	8.886e-03
4.0	2.950e+00	2.202e-11	1.880e-10	2.725e-14	2.326e-13
TOTALS:	7.719e+14	6.543e-01	9.363e+00	9.141e-04	1.345e-02

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Pennsylvania Power & Light Co.

Page : 1
DOS File: 1CS96.MS5
Run Date: August 28, 2005
Run Time: 2:19:10 PM
Duration: 00:00:45

EC-RADN-1129
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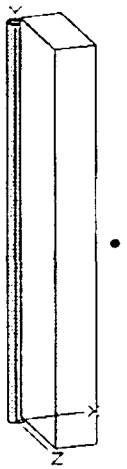
File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 14 inch core spray - Time = 96 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.0176e-003	3.7652e+007	1.2510e-003	4.6287e+001
Ba-137m	7.9337e+002	2.9355e+013	9.7533e+002	3.6087e+007
Ba-139				
Ba-140	6.1146e+002	2.2624e+013	7.5170e+002	2.7813e+007
Ce-141	1.6057e+001	5.9412e+011	1.9740e+001	7.3038e+005
Ce-143	2.1548e+000	7.9728e+010	2.6490e+000	9.8013e+004
Ce-144	1.4520e+001	5.3724e+011	1.7850e+001	6.6045e+005
Cm-242	2.5371e-001	9.3873e+009	3.1190e-001	1.1540e+004
Cm-244	1.5114e-002	5.5921e+008	1.8580e-002	6.8746e+002
Co-58	2.7633e-001	1.0224e+010	3.3970e-001	1.2569e+004
Co-60	1.5439e-001	5.7125e+009	1.8980e-001	7.0226e+003
Cs-134	1.1103e+003	4.1083e+013	1.3650e+003	5.0505e+007
Cs-136	2.8788e+002	1.0651e+013	3.5390e+002	1.3094e+007
Cs-137	8.3866e+002	3.1030e+013	1.0310e+003	3.8147e+007
I-131	4.4227e+003	1.6364e+014	5.4370e+003	2.0117e+008
I-132	7.6130e+002	2.8168e+013	9.3590e+002	3.4628e+007
I-133	5.2727e+002	1.9509e+013	6.4820e+002	2.3983e+007
I-134				
I-135	5.2093e-001	1.9274e+010	6.4040e-001	2.3695e+004
La-140	5.3939e+002	1.9957e+013	6.6310e+002	2.4535e+007
La-141	3.0569e-007	1.1311e+004	3.7580e-007	1.3905e-002
La-142				
Mo-99	3.5734e+001	1.3222e+012	4.3930e+001	1.6254e+006
Nb-95	7.4275e+000	2.7482e+011	9.1310e+000	3.3785e+005

DOS File: 1CS96.MS5
Run Date: August 28, 2005
Run Time: 2:19:10 PM
Duration: 00:00:45

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.1865e+000	8.0901e+010	2.6880e+000	9.9456e+004
Np-239	6.3367e+001	2.3446e+012	7.7900e+001	2.8823e+006
Pr-143	6.3131e+000	2.3358e+011	7.7610e+000	2.8716e+005
Pr-144	1.4312e+001	5.2955e+011	1.7595e+001	6.5101e+005
Pu-238	4.4202e-002	1.6355e+009	5.4340e-002	2.0106e+003
Pu-239	4.7302e-003	1.7502e+008	5.8150e-003	2.1516e+002
Pu-240	7.5463e-003	2.7921e+008	9.2770e-003	3.4325e+002
Pu-241	1.8603e+000	6.8832e+010	2.2870e+000	8.4619e+004
Rb-86	9.0617e+000	3.3528e+011	1.1140e+001	4.1218e+005
Rh-103m	7.7585e+001	2.8706e+012	9.5378e+001	3.5290e+006
Rh-105	9.4522e+000	3.4973e+011	1.1620e+001	4.2994e+005
Rh-106	3.2985e+001	1.2204e+012	4.0550e+001	1.5004e+006
Ru-103	7.7789e+001	2.8782e+012	9.5630e+001	3.5383e+006
Ru-105	1.7871e-005	6.6124e+005	2.1970e-005	8.1289e-001
Ru-106	3.2985e+001	1.2204e+012	4.0550e+001	1.5004e+006
Sb-127	4.4341e+001	1.6406e+012	5.4510e+001	2.0169e+006
Sb-129	6.8809e-005	2.5459e+006	8.4590e-005	3.1298e+000
Sr-89	3.7752e+002	1.3968e+013	4.6410e+002	1.7172e+007
Sr-90	5.0816e+001	1.8802e+012	6.2470e+001	2.3114e+006
Sr-91	4.6146e-001	1.7074e+010	5.6730e-001	2.0990e+004
Sr-92	1.1705e-008	4.3310e+002	1.4390e-008	5.3243e-004
Tc-99m	3.6637e+001	1.3556e+012	4.5040e+001	1.6665e+006
Te-127	5.7551e+001	2.1294e+012	7.0750e+001	2.6178e+006
Te-127m	1.5309e+001	5.6643e+011	1.8820e+001	6.9634e+005
Te-129	5.1686e+001	1.9124e+012	6.3540e+001	2.3510e+006
Te-129m	5.9772e+001	2.2115e+012	7.3480e+001	2.7188e+006
Te-131m	2.2679e+001	8.3911e+011	2.7880e+001	1.0316e+006
Te-132	6.3782e+002	2.3599e+013	7.8410e+002	2.9012e+007
Y-90	3.2969e+001	1.2198e+012	4.0530e+001	1.4996e+006
Y-91	6.2244e+000	2.3030e+011	7.6520e+000	2.8312e+005
Y-92	1.1901e-005	4.4032e+005	1.4630e-005	5.4131e-001
Y-93	5.7047e-003	2.1107e+008	7.0130e-003	2.5948e+002
Zr-95	7.1290e+000	2.6377e+011	8.7640e+000	3.2427e+005
Zr-97	1.4365e-001	5.3152e+009	1.7660e-001	6.5342e+003

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.250e+08	0.000e+00	2.476e-26	0.000e+00	2.123e-27
0.02	3.881e+11	0.000e+00	6.717e-23	0.000e+00	2.327e-24
[illegible]	3.185e+13	1.334e-193	1.219e-20	1.322e-195	1.208e-22
0.04	1.217e+12	1.506e-94	1.235e-21	6.660e-97	5.463e-24
0.05	3.107e+12	3.704e-58	1.031e-20	9.867e-61	2.747e-23

DOS File: 1CS96.MS5
Run Date: August 28, 2005
Run Time: 2:19:10 PM
Duration: 00:00:45

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.389e+12	2.058e-42	3.308e-20	4.088e-45	6.571e-23
0.08	4.999e+12	1.725e-28	2.833e-19	2.730e-31	4.483e-22
0.1	2.778e+12	2.237e-23	7.276e-19	3.422e-26	1.113e-21
0.15	4.792e+12	9.330e-18	9.854e-15	1.536e-20	1.623e-17
0.2	2.341e+13	1.540e-14	2.035e-11	2.718e-17	3.592e-14
0.3	2.419e+13	1.488e-11	1.317e-08	2.823e-14	2.498e-11
0.4	1.356e+14	6.945e-09	3.563e-06	1.353e-11	6.942e-09
0.5	4.369e+13	5.841e-08	1.871e-05	1.147e-10	3.672e-08
0.6	1.260e+14	2.172e-06	4.648e-04	4.239e-09	9.072e-07
0.8	8.907e+13	7.259e-05	8.382e-03	1.381e-07	1.594e-05
1.0	2.301e+13	3.192e-04	2.291e-02	5.884e-07	4.222e-05
1.5	2.519e+13	3.993e-02	1.322e+00	6.719e-05	2.224e-03
2.0	1.136e+12	3.386e-02	7.109e-01	5.236e-05	1.099e-03
3.0	7.106e+11	6.936e-01	8.301e+00	9.409e-04	1.126e-02
TOTALS:	5.425e+14	7.677e-01	1.037e+01	1.061e-03	1.464e-02

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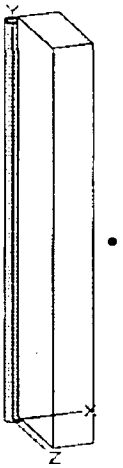
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
DOS File: 1CS240.MS5
Run Date: August 28, 2005
Run Time: 2:14:35 PM
Duration: 00:00:53

EC-RADN-1129
Page 437

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

Case Title: Control Room
Description: 14 inch core spray - Time = 240 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	8.9560e-004	3.3137e+007	1.1010e-003	4.0737e+001
Ba-137m	6.6548e+002	2.4623e+013	8.1810e+002	3.0270e+007
Ba-139				
Ba-140	3.7036e+002	1.3703e+013	4.5530e+002	1.6846e+007
Ce-141	1.1860e+001	4.3882e+011	1.4580e+001	5.3946e+005
Ce-143	8.7851e-002	3.2505e+009	1.0800e-001	3.9960e+003
Ce-144	1.2015e+001	4.4454e+011	1.4770e+001	5.4649e+005
Cm-242	2.0759e-001	7.6808e+009	2.5520e-001	9.4424e+003
Cm-244	1.2682e-002	4.6922e+008	1.5590e-002	5.7683e+002
Co-58	2.1873e-001	8.0932e+009	2.6890e-001	9.9493e+003
Co-60	1.2934e-001	4.7855e+009	1.5900e-001	5.8830e+003
Cs-134	9.2651e+002	3.4281e+013	1.1390e+003	4.2143e+007
Cs-136	1.7595e+002	6.5100e+012	2.1630e+002	8.0031e+006
Cs-137	7.0346e+002	2.6028e+013	8.6480e+002	3.1998e+007
I-131	2.2150e+003	8.1955e+013	2.7230e+003	1.0075e+008
I-132	1.7831e+002	6.5973e+012	2.1920e+002	8.1104e+006
I-133	3.6475e+000	1.3496e+011	4.4840e+000	1.6591e+005
I-134				
I-135	1.2096e-007	4.4755e+003	1.4870e-007	5.5019e-003
La-140	4.1811e+002	1.5470e+013	5.1400e+002	1.9018e+007
La-141				
La-142				
Mo-99	6.6116e+000	2.4463e+011	8.1280e+000	3.0074e+005
Nb-95	6.1789e+000	2.2862e+011	7.5960e+000	2.8105e+005

DOS File: 1CS240.MS5
Run Date: August 28, 2005
Run Time: 2:14:35 PM
Duration: 00:00:53

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	1.2568e+000	4.6500e+010	1.5450e+000	5.7165e+004
Np-239	9.0943e+000	3.3649e+011	1.1180e+001	4.1366e+005
Pr-143	4.0404e+000	1.4949e+011	4.9670e+000	1.8378e+005
Pr-144	1.1843e+001	4.3818e+011	1.4559e+001	5.3868e+005
Pu-238	3.7125e-002	1.3736e+009	4.5640e-002	1.6887e+003
Pu-239	3.9826e-003	1.4736e+008	4.8960e-003	1.8115e+002
Pu-240	6.3351e-003	2.3440e+008	7.7880e-003	2.8816e+002
Pu-241	1.5602e+000	5.7727e+010	1.9180e+000	7.0966e+004
Rb-86	6.0886e+000	2.2528e+011	7.4850e+000	2.7694e+005
Rh-103m	5.8584e+001	2.1676e+012	7.2020e+001	2.6647e+006
Rh-105	4.7171e-001	1.7453e+010	5.7990e-001	2.1456e+004
Rh-106	2.7380e+001	1.0131e+012	3.3660e+001	1.2454e+006
Ru-103	5.8738e+001	2.1733e+012	7.2210e+001	2.6718e+006
Ru-105	2.5884e-015	9.5769e-005	3.1820e-015	1.1773e-010
Ru-106	2.7380e+001	1.0131e+012	3.3660e+001	1.2454e+006
Sb-127	1.2633e+001	4.6741e+011	1.5530e+001	5.7461e+005
Sb-129	5.3370e-015	1.9747e-004	6.5610e-015	2.4276e-010
Sr-89	2.9186e+002	1.0799e+013	3.5880e+002	1.3276e+007
Sr-90	4.2641e+001	1.5777e+012	5.2420e+001	1.9395e+006
Sr-91	1.0599e-005	3.9217e+005	1.3030e-005	4.8211e-001
Sr-92				
Tc-99m	6.7784e+000	2.5080e+011	8.3330e+000	3.0832e+005
Te-127	2.4737e+001	9.1526e+011	3.0410e+001	1.1252e+006
Te-127m	1.2527e+001	4.6350e+011	1.5400e+001	5.6980e+005
Te-129	3.8337e+001	1.4185e+012	4.7130e+001	1.7438e+006
Te-129m	4.4332e+001	1.6403e+012	5.4500e+001	2.0165e+006
Te-131m	6.8329e-001	2.5282e+010	8.4000e-001	3.1080e+004
Te-132	1.4943e+002	5.5289e+012	1.8370e+002	6.7969e+006
Y-90	3.9688e+001	1.4684e+012	4.8790e+001	1.8052e+006
Y-91	4.8676e+000	1.8010e+011	5.9840e+000	2.2141e+005
Y-92				
Y-93	2.4452e-007	9.0472e+003	3.0060e-007	1.1122e-002
Zr-95	5.6079e+000	2.0749e+011	6.8940e+000	2.5508e+005
Zr-97	3.2830e-004	1.2147e+007	4.0360e-004	1.4933e+001

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.870e+08	0.000e+00	2.058e-26	0.000e+00	1.765e-27
0.02	2.118e+11	0.000e+00	3.666e-23	0.000e+00	1.270e-24
[illegible]	1.327e+13	5.557e-194	5.080e-21	5.508e-196	5.035e-23
0.04	8.490e+11	1.051e-94	8.618e-22	4.647e-97	3.811e-24
0.05	7.334e+11	8.742e-59	2.434e-21	2.329e-61	6.483e-24

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Duration: 00:00:53

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	8.245e+11	1.222e-42	1.964e-20	2.426e-45	3.900e-23
0.08	2.563e+12	8.845e-29	1.452e-19	1.400e-31	2.299e-22
0.1	5.357e+11	4.314e-24	1.403e-19	6.600e-27	2.147e-22
0.15	2.396e+12	4.665e-18	4.927e-15	7.682e-21	8.114e-18
0.2	6.151e+12	4.045e-15	5.347e-12	7.139e-18	9.437e-15
0.3	1.356e+13	8.344e-12	7.383e-09	1.583e-14	1.401e-11
0.4	6.791e+13	3.478e-09	1.785e-06	6.778e-12	3.477e-09
0.5	1.551e+13	2.074e-08	6.643e-06	4.072e-11	1.304e-08
0.6	7.887e+13	1.359e-06	2.909e-04	2.653e-09	5.678e-07
0.8	5.232e+13	4.264e-05	4.924e-03	8.110e-08	9.366e-06
1.0	1.112e+13	1.543e-04	1.107e-02	2.844e-07	2.041e-05
1.5	1.685e+13	2.672e-02	8.843e-01	4.495e-05	1.488e-03
2.0	3.529e+11	1.052e-02	2.208e-01	1.626e-05	3.414e-04
3.0	5.509e+11	5.376e-01	6.435e+00	7.294e-04	8.730e-03
TOTALS:	2.846e+14	5.750e-01	7.556e+00	7.910e-04	1.059e-02

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

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DOS File: 1CS480.MS5
Date: August 28, 2005
Time: 2:16:52 PM
Duration: 00:00:50

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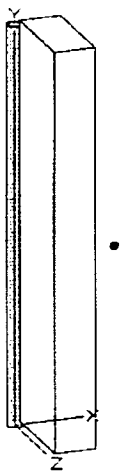
File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 14 inch core spray - Time = 480 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	7.1998e-004	2.6639e+007	8.8510e-004	3.2749e+001
Ba-137m	4.9672e+002	1.8379e+013	6.1064e+002	2.2594e+007
Ba-139				
Ba-140	1.6057e+002	5.9412e+012	1.9740e+002	7.3038e+006
Ce-141	7.1566e+000	2.6480e+011	8.7980e+000	3.2553e+005
Ce-143	4.2453e-004	1.5708e+007	5.2190e-004	1.9310e+001
Ce-144	8.7526e+000	3.2385e+011	1.0760e+001	3.9812e+005
Cm-242	1.4862e-001	5.4988e+009	1.8270e-001	6.7599e+003
Cm-244	9.4603e-003	3.5003e+008	1.1630e-002	4.3031e+002
Co-58	1.4813e-001	5.4807e+009	1.8210e-001	6.7377e+003
Co-60	9.6311e-002	3.5635e+009	1.1840e-001	4.3808e+003
Cs-134	6.8581e+002	2.5375e+013	8.4310e+002	3.1195e+007
Cs-136	7.7415e+001	2.8644e+012	9.5170e+001	3.5213e+006
Cs-137	5.2508e+002	1.9428e+013	6.4550e+002	2.3883e+007
I-131	6.9866e+002	2.5851e+013	8.5890e+002	3.1779e+007
I-132	1.5870e+001	5.8720e+011	1.9510e+001	7.2187e+005
I-133	9.1593e-004	3.3890e+007	1.1260e-003	4.1662e+001
I-134				
I-135				
La-140	1.8636e+002	6.8953e+012	2.2910e+002	8.4767e+006
La-141				
La-142				
Mo-99	3.9720e-001	1.4696e+010	4.8830e-001	1.8067e+004
Nb-95	4.4918e+000	1.6620e+011	5.5220e+000	2.0431e+005

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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	4.9945e-001	1.8480e+010	6.1400e-001	2.2718e+004
Np-239	3.5808e-001	1.3249e+010	4.4020e-001	1.6287e+004
Pr-143	1.8148e+000	6.7147e+010	2.2310e+000	8.2547e+004
Pr-144	8.6274e+000	3.1922e+011	1.0606e+001	3.9243e+005
Pu-238	2.7763e-002	1.0272e+009	3.4130e-002	1.2628e+003
Pu-239	2.9764e-003	1.1013e+008	3.6590e-003	1.3538e+002
Pu-240	4.7318e-003	1.7508e+008	5.8170e-003	2.1523e+002
Pu-241	1.1640e+000	4.3069e+010	1.4310e+000	5.2947e+004
Rb-86	3.1366e+000	1.1606e+011	3.8560e+000	1.4267e+005
Rh-103m	3.6679e+001	1.3571e+012	4.5091e+001	1.6684e+006
Rh-105	3.1903e-003	1.1804e+008	3.9220e-003	1.4511e+002
Rh-106	2.0068e+001	7.4250e+011	2.4670e+001	9.1279e+005
Ru-103	3.6776e+001	1.3607e+012	4.5210e+001	1.6728e+006
Ru-105				
Ru-106	2.0068e+001	7.4250e+011	2.4670e+001	9.1279e+005
Sb-127	1.5594e+000	5.7696e+010	1.9170e+000	7.0929e+004
Sb-129				
Sr-89	1.9002e+002	7.0307e+012	2.3360e+002	8.6432e+006
Sr-90	3.1830e+001	1.1777e+012	3.9130e+001	1.4478e+006
Sr-91	1.9653e-013	7.2715e-003	2.4160e-013	8.9392e-009
Sr-92				
Tc-99m	4.0721e-001	1.5067e+010	5.0060e-001	1.8522e+004
Te-127	1.0485e+001	3.8795e+011	1.2890e+001	4.7693e+005
Te-127m	8.8258e+000	3.2656e+011	1.0850e+001	4.0145e+005
Te-129	2.3297e+001	8.6199e+011	2.8640e+001	1.0597e+006
Te-129m	2.6941e+001	9.9682e+011	3.3120e+001	1.2254e+006
Te-131m	1.9937e-003	7.3768e+007	2.4510e-003	9.0687e+001
Te-132	1.3300e+001	4.9209e+011	1.6350e+001	6.0495e+005
Y-90	3.1838e+001	1.1780e+012	3.9140e+001	1.4482e+006
Y-91	3.2294e+000	1.1949e+011	3.9700e+000	1.4689e+005
Y-92				
Y-93	1.2836e-014	4.7493e-004	1.5780e-014	5.8386e-010
Zr-95	3.7589e+000	1.3908e+011	4.6210e+000	1.7098e+005
Zr-97	1.3023e-008	4.8186e+002	1.6010e-008	5.9237e-004

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.360e+08	0.000e+00	1.496e-26	0.000e+00	1.283e-27
0.02	1.178e+11	0.000e+00	2.039e-23	0.000e+00	7.063e-25
0.03	4.742e+12	1.985e-194	1.815e-21	1.968e-196	1.799e-23
0.04	5.147e+11	6.369e-95	5.224e-22	2.817e-97	2.311e-24
0.05	6.962e+10	8.298e-60	2.310e-22	2.211e-62	6.154e-25

DOS File: 1CS480.MS5
Run Date: August 28, 2005
Run Time: 2:16:52 PM
Duration: 00:00:50

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	3.596e+11	5.329e-43	8.566e-21	1.058e-45	1.701e-23
0.08	8.622e+11	2.975e-29	4.886e-20	4.708e-32	7.731e-23
0.1	6.403e+10	5.155e-25	1.677e-20	7.887e-28	2.566e-23
0.15	1.002e+12	1.951e-18	2.061e-15	3.213e-21	3.393e-18
0.2	9.418e+11	6.194e-16	8.187e-13	1.093e-18	1.445e-15
0.3	5.219e+12	3.211e-12	2.841e-09	6.090e-15	5.389e-12
0.4	2.152e+13	1.102e-09	5.656e-07	2.148e-12	1.102e-09
0.5	6.753e+12	9.030e-09	2.892e-06	1.772e-11	5.677e-09
0.6	5.026e+13	8.664e-07	1.854e-04	1.691e-09	3.619e-07
0.8	3.042e+13	2.479e-05	2.863e-03	4.715e-08	5.445e-06
1.0	4.517e+12	6.267e-05	4.497e-03	1.155e-07	8.289e-06
1.5	7.456e+12	1.182e-02	3.913e-01	1.989e-05	6.583e-04
2.0	8.044e+10	2.397e-03	5.032e-02	3.707e-06	7.782e-05
3.0	2.455e+11	2.396e-01	2.868e+00	3.251e-04	3.891e-03
TOTALS:	1.352e+14	2.539e-01	3.317e+00	3.489e-04	4.641e-03

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

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DOS File: 1CS720.MS5
Run Date: August 28, 2005
Run Time: 2:17:43 PM
Duration: 00:00:42

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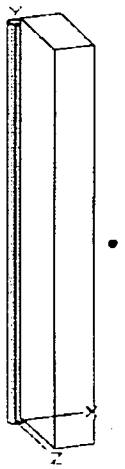
File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 14 inch core spray - Time = 720 hour
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	195.58 cm
	5 ft 0.0 in	15 ft	6 ft 5.0 in

Shields

Shield Name	Dimension	Material	Density
Source	8.13e+05 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	5.7592e-004	2.1309e+007	7.0800e-004	2.6196e+001
Ba-137m	3.7083e+002	1.3721e+013	4.5588e+002	1.6867e+007
Ba-139				
Ba-140	6.9606e+001	2.5754e+012	8.5570e+001	3.1661e+006
Ce-141	4.3194e+000	1.5982e+011	5.3100e+000	1.9647e+005
Ce-143	2.0507e-006	7.5875e+004	2.5210e-006	9.3277e-002
Ce-144	6.3839e+000	2.3620e+011	7.8480e+000	2.9038e+005
Cm-242	1.0640e-001	3.9367e+009	1.3080e-001	4.8396e+003
Cm-244	7.0623e-003	2.6130e+008	8.6820e-003	3.2123e+002
Co-58	1.0038e-001	3.7140e+009	1.2340e-001	4.5658e+003
Co-60	7.1656e-002	2.6513e+009	8.8090e-002	3.2593e+003
Cs-134	5.0767e+002	1.8784e+013	6.2410e+002	2.3092e+007
Cs-136	3.4067e+001	1.2605e+012	4.1880e+001	1.5496e+006
Cs-137	3.9200e+002	1.4504e+013	4.8190e+002	1.7830e+007
I-131	2.2036e+002	8.1533e+012	2.7090e+002	1.0023e+007
I-132	1.4129e+000	5.2279e+010	1.7370e+000	6.4269e+004
I-133	2.3004e-007	8.5115e+003	2.8280e-007	1.0464e-002
I-134				
I-135				
La-140	8.0848e+001	2.9914e+012	9.9390e+001	3.6774e+006
La-141				
La-142				
Mo-99	2.3858e-002	8.8275e+008	2.9330e-002	1.0852e+003
Nb-95	3.2253e+000	1.1934e+011	3.9650e+000	1.4671e+005

DOS File: 1CS720.MS5
Run Date: August 28, 2005
Run Time: 2:17:43 PM
Duration: 00:00:42

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	1.9848e-001	7.3437e+009	2.4400e-001	9.0280e+003
Np-239	1.4097e-002	5.2159e+008	1.7330e-002	6.4121e+002
Pr-143	8.1303e-001	3.0082e+010	9.9950e-001	3.6982e+004
Pr-144	6.2926e+000	2.3283e+011	7.7358e+000	2.8622e+005
Pu-238	2.0759e-002	7.6808e+008	2.5520e-002	9.4424e+002
Pu-239	2.2231e-003	8.2256e+007	2.7330e-003	1.0112e+002
Pu-240	3.5344e-003	1.3077e+008	4.3450e-003	1.6076e+002
Pu-241	8.6794e-001	3.2114e+010	1.0670e+000	3.9479e+004
Rb-86	1.6163e+000	5.9803e+010	1.9870e+000	7.3519e+004
Rh-103m	2.2968e+001	8.4981e+011	2.8236e+001	1.0447e+006
Rh-105	2.1572e-005	7.9818e+005	2.6520e-005	9.8124e-001
Rh-106	1.4715e+001	5.4446e+011	1.8090e+001	6.6933e+005
Ru-103	2.3028e+001	8.5205e+011	2.8310e+001	1.0475e+006
Ru-105				
Ru-106	1.4715e+001	5.4446e+011	1.8090e+001	6.6933e+005
Sb-127	1.9254e-001	7.1240e+009	2.3670e-001	8.7579e+003
Sb-129				
Sr-89	1.2372e+002	4.5778e+012	1.5210e+002	5.6277e+006
Sr-90	2.3761e+001	8.7914e+011	2.9210e+001	1.0808e+006
Sr-91				
Sr-92				
Tc-99m	2.4460e-002	9.0502e+008	3.0070e-002	1.1126e+003
Te-127	6.5026e+000	2.4060e+011	7.9940e+000	2.9578e+005
Te-127m	6.1935e+000	2.2916e+011	7.6140e+000	2.8172e+005
Te-129	1.4162e+001	5.2399e+011	1.7410e+001	6.4417e+005
Te-129m	1.6375e+001	6.0586e+011	2.0130e+001	7.4481e+005
Te-131m	5.8185e-006	2.1529e+005	7.1530e-006	2.6466e-001
Te-132	1.1836e+000	4.3792e+010	1.4550e+000	5.3835e+004
Y-90	2.3883e-001	8.8366e+009	2.9360e-001	1.0863e+004
Y-91	2.1426e+000	7.9276e+010	2.6340e+000	9.7458e+004
Y-92				
Y-93				
Zr-95	2.5192e+000	9.3211e+010	3.0970e+000	1.1459e+005
Zr-97	5.1637e-013	1.9106e-002	6.3480e-013	2.3488e-008

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	9.763e+07	0.000e+00	1.074e-26	0.000e+00	9.212e-28
0.02	7.287e+10	0.000e+00	1.261e-23	0.000e+00	4.370e-25
[illegible]	2.295e+12	9.609e-195	8.784e-22	9.523e-197	8.705e-24
0.04	3.311e+11	4.097e-95	3.360e-22	1.812e-97	1.486e-24
0.05	8.924e+09	1.064e-60	2.961e-23	2.834e-63	7.889e-26

DOS File: 1CS720.MS5
Run Date: August 28, 2005
Run Time: 2:17:43 PM
Duration: 00:00:42

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.584e+11	2.347e-43	3.772e-21	4.661e-46	7.493e-24
0.08	2.966e+11	1.024e-29	1.681e-20	1.620e-32	2.660e-23
0.1	1.772e+10	1.426e-25	4.640e-21	2.182e-28	7.099e-24
0.15	4.633e+11	9.020e-19	9.526e-16	1.485e-21	1.569e-18
0.2	2.525e+11	1.661e-16	2.195e-13	2.931e-19	3.875e-16
0.3	2.072e+12	1.275e-12	1.128e-09	2.418e-15	2.139e-12
0.4	6.848e+12	3.508e-10	1.800e-07	6.834e-13	3.506e-10
0.5	3.270e+12	4.373e-09	1.400e-06	8.583e-12	2.749e-09
0.6	3.597e+13	6.200e-07	1.327e-04	1.210e-09	2.590e-07
0.8	2.037e+13	1.660e-05	1.917e-03	3.157e-08	3.646e-06
1.0	2.143e+12	2.974e-05	2.134e-03	5.481e-08	3.933e-06
1.5	3.443e+12	5.459e-03	1.807e-01	9.185e-06	3.040e-04
2.0	2.897e+10	8.633e-04	1.812e-02	1.335e-06	2.803e-05
3.0	1.065e+11	1.040e-01	1.244e+00	1.410e-04	1.688e-03
TOTALS:	7.815e+13	1.103e-01	1.447e+00	1.516e-04	2.028e-03

For Information Only

PP&L CALCULATION SHEET

Dept. Rad. & Eff. Tech.	PROJECT	Calc. No. EC-RADN-1129
Date 08/31/2005	DBA-LOCA Total Control Room Dose	
Designed By T.F. Mackay		Sh. No. 446
Checked By M.M. Waselus		

ATTACHMENT 10
MICROSHIELD COMPUTER CODE OUTPUT
12"GBB-107 SHINE TO MAIN CONTROL ROOM / TSC

For Information Only

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

Page : 1
DOS File: RHR166.MS5
Date: September 2, 2005
Time: 2:50:57 PM
Duration: 00:00:25

EC-RADN-1129
Page 447

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

Case Title: Control Room
Description: 12 inch RHR - Time = 0.1667 hour
Geometry: 7 - Cylinder Volume - Side Shields

Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241				
Ba-137m	8.1148e+001	3.0025e+012	7.2974e+001	2.7001e+006
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	1.1398e+002	4.2173e+012	1.0250e+002	3.7925e+006
Cs-136	3.6374e+001	1.3458e+012	3.2710e+001	1.2103e+006
Cs-137	8.5780e+001	3.1738e+012	7.7140e+001	2.8542e+006
I-131	5.2953e+002	1.9593e+013	4.7620e+002	1.7619e+007
I-132	7.4882e+002	2.7706e+013	6.7340e+002	2.4916e+007
I-133	1.0955e+003	4.0535e+013	9.8520e+002	3.6452e+007
I-134	1.0655e+003	3.9424e+013	9.5820e+002	3.5453e+007
I-135	1.0276e+003	3.8021e+013	9.2410e+002	3.4192e+007
La-140				
La-141				
La-142				
Mo-99				
Nb-95				

DOS File: RHR166.MS5
Run Date: September 2, 2005
Run Time: 2:50:57 PM
Duration: 00:00:25

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	1.0754e+000	3.9790e+010	9.6710e-001	3.5783e+004
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	2.393e+12	6.465e-133	1.353e-23	6.408e-135	1.341e-25
0.04	9.249e+10	1.342e-65	1.387e-24	5.936e-68	6.133e-27
[illegible]6	1.677e+11	1.400e-29	5.901e-23	2.781e-32	1.172e-25
[illegible].08	5.975e+11	8.063e-20	7.754e-18	1.276e-22	1.227e-20
0.1	5.501e+09	3.724e-18	8.380e-16	5.697e-21	1.282e-18

DOS File: RHR166.MS5
Run Date: September 2, 2005
Run Time: 2:50:57 PM
Duration: 00:00:25

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.15	2.133e+12	7.426e-12	3.280e-09	1.223e-14	5.401e-12
0.2	2.187e+12	4.201e-10	2.067e-07	7.414e-13	3.648e-10
0.3	4.650e+12	9.870e-08	3.344e-05	1.872e-10	6.343e-08
0.4	2.371e+13	1.048e-05	2.220e-03	2.042e-08	4.326e-06
0.5	5.074e+13	2.102e-04	2.963e-02	4.126e-07	5.816e-05
0.6	5.880e+13	1.405e-03	1.399e-01	2.742e-06	2.730e-04
0.8	1.074e+14	3.593e-02	2.070e+00	6.834e-05	3.937e-03
1.0	4.150e+13	9.643e-02	3.671e+00	1.777e-04	6.767e-03
1.5	3.129e+13	1.847e+00	3.534e+01	3.108e-03	5.946e-02
2.0	8.254e+12	3.612e+00	4.589e+01	5.586e-03	7.096e-02
TOTALS:	3.339e+14	5.593e+00	8.714e+01	8.943e-03	1.415e-01

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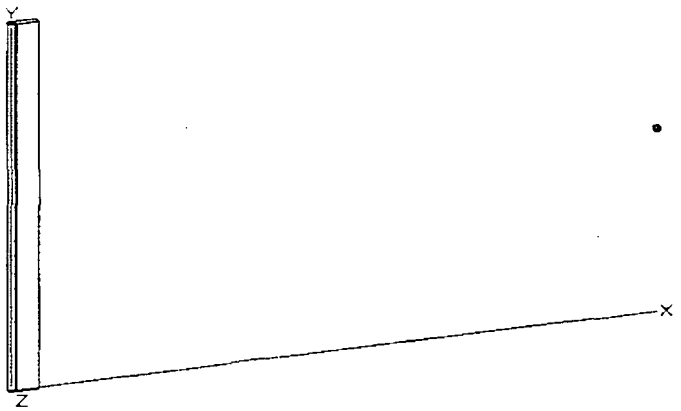
Pennsylvania Power & Light Co.

Page : 1
DOS File: RHR05.MS5
Date: September 2, 2005
Time: 2:49:24 PM
Duration: 00:00:25

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

Case Title: Control Room
Description: 12 inch RHR - Time = 0.5 hour
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241				
Ba-137m	2.4332e+002	9.0027e+012	2.1881e+002	8.0960e+006
Ba-139				
Ba-140				
Ce-141				
Ce-143				
Ce-144				
Cm-242				
Cm-244				
Co-58				
Co-60				
Cs-134	3.4172e+002	1.2644e+013	3.0730e+002	1.1370e+007
Cs-136	1.0900e+002	4.0329e+012	9.8020e+001	3.6267e+006
Cs-137	2.5721e+002	9.5166e+012	2.3130e+002	8.5581e+006
I-131	1.5857e+003	5.8671e+013	1.4260e+003	5.2762e+007
I-132	2.1350e+003	7.8996e+013	1.9200e+003	7.1040e+007
I-133	3.2493e+003	1.2022e+014	2.9220e+003	1.0811e+008
I-134	2.4553e+003	9.0846e+013	2.2080e+003	8.1696e+007
I-135	2.9757e+003	1.1010e+014	2.6760e+003	9.9012e+007
La-140				
La-141				
La-142				
Mo-99				
Nb-95				

For Information Only

DOS File: RHR05.MS5
Run Date: September 2, 2005
Run Time: 2:49:24 PM
Duration: 00:00:25

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147				
Np-239				
Pr-143				
Pr-144				
Pu-238				
Pu-239				
Pu-240				
Pu-241				
Rb-86	3.2226e+000	1.1924e+011	2.8980e+000	1.0723e+005
Rh-103m				
Rh-105				
Rh-106				
Ru-103				
Ru-105				
Ru-106				
Sb-127				
Sb-129				
Sr-89				
Sr-90				
Sr-91				
Sr-92				
Tc-99m				
Te-127				
Te-127m				
Te-129				
Te-129m				
Te-131m				
Te-132				
Y-90				
Y-91				
Y-92				
Y-93				
Zr-95				
Zr-97				

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.03	6.714e+12	1.814e-132	3.796e-23	1.798e-134	3.762e-25
0.04	2.773e+11	4.023e-65	4.157e-24	1.779e-67	1.838e-26
[illegible]	5.026e+11	4.196e-29	1.768e-22	8.334e-32	3.512e-25
[illegible].08	1.789e+12	2.415e-19	2.322e-17	3.821e-22	3.675e-20
0.1	1.649e+10	1.116e-17	2.511e-15	1.707e-20	3.842e-18

DOS File: RHR05.MS5
Run Date: September 2, 2005
Run Time: 2:49:24 PM
Duration: 00:00:25

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.15	5.068e+12	1.765e-11	7.795e-09	2.906e-14	1.284e-11
0.2	5.673e+12	1.090e-09	5.361e-07	1.923e-12	9.462e-10
0.3	1.351e+13	2.868e-07	9.715e-05	5.440e-10	1.843e-07
0.4	6.726e+13	2.974e-05	6.299e-03	5.795e-08	1.227e-05
0.5	1.461e+14	6.052e-04	8.531e-02	1.188e-06	1.675e-04
0.6	1.618e+14	3.865e-03	3.848e-01	7.543e-06	7.511e-04
0.8	2.695e+14	9.019e-02	5.196e+00	1.716e-04	9.884e-03
1.0	1.110e+14	2.580e-01	9.822e+00	4.756e-04	1.811e-02
1.5	8.736e+13	5.158e+00	9.868e+01	8.678e-03	1.660e-01
2.0	2.199e+13	9.625e+00	1.223e+02	1.488e-02	1.891e-01
TOTALS:	8.986e+14	1.514e+01	2.364e+02	2.422e-02	3.840e-01

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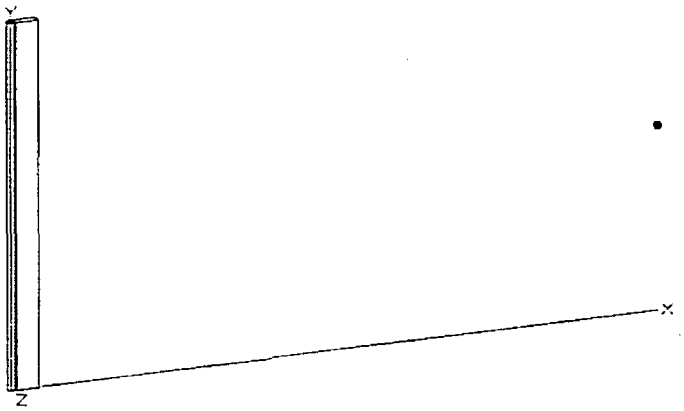
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
DOS File: RHR1.MS5
Date: September 2, 2005
Time: 2:49:49 PM
Duration: 00:00:33

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

Case Title: Control Room
Description: 12 inch RHR - Time = 1 hour
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	5.0374e-004	1.8638e+007	4.5300e-004	1.6761e+001
Ba-137m	5.6763e+002	2.1002e+013	5.1046e+002	1.8887e+007
Ba-139	2.3396e+002	8.6567e+012	2.1040e+002	7.7848e+006
Ba-140	3.8764e+002	1.4343e+013	3.4860e+002	1.2898e+007
Ce-141	8.9116e+000	3.2973e+011	8.0140e+000	2.9652e+005
Ce-143	8.1020e+000	2.9978e+011	7.2860e+000	2.6958e+005
Ce-144	7.4938e+000	2.7727e+011	6.7390e+000	2.4934e+005
Cm-242	1.3188e-001	4.8797e+009	1.1860e-001	4.3882e+003
Cm-244	7.7306e-003	2.8603e+008	6.9520e-003	2.5722e+002
Co-58	1.4678e-001	5.4310e+009	1.3200e-001	4.8840e+003
Co-60	7.9041e-002	2.9245e+009	7.1080e-002	2.6300e+003
Cs-134	7.9719e+002	2.9496e+013	7.1690e+002	2.6525e+007
Cs-136	2.5398e+002	9.3973e+012	2.2840e+002	8.4508e+006
Cs-137	6.0004e+002	2.2201e+013	5.3960e+002	1.9965e+007
I-131	4.2223e+003	1.5622e+014	3.7970e+003	1.4049e+008
I-132	5.4510e+003	2.0169e+014	4.9020e+003	1.8137e+008
I-133	8.5190e+003	3.1520e+014	7.6610e+003	2.8346e+008
I-134	4.4080e+003	1.6309e+014	3.9640e+003	1.4667e+008
I-135	7.5282e+003	2.7854e+014	6.7700e+003	2.5049e+008
La-140	6.1149e+000	2.2625e+011	5.4990e+000	2.0346e+005
La-141	2.9557e+000	1.0936e+011	2.6580e+000	9.8346e+004
La-142	2.2018e+000	8.1465e+010	1.9800e+000	7.3260e+004
Mo-99	4.9540e+001	1.8330e+012	4.4550e+001	1.6483e+006
Nb-95	3.8053e+000	1.4079e+011	3.4220e+000	1.2661e+005

DOS File: RHR1.MS5
Run Date: September 2, 2005
Run Time: 2:49:49 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	1.4356e+000	5.3117e+010	1.2910e+000	4.7767e+004
Np-239	1.0385e+002	3.8424e+012	9.3390e+001	3.4554e+006
Pr-143	3.1926e+000	1.1812e+011	2.8710e+000	1.0623e+005
Pr-144	7.3866e+000	2.7330e+011	6.6426e+000	2.4578e+005
Pu-238	2.2585e-002	8.3563e+008	2.0310e-002	7.5147e+002
Pu-239	2.3986e-003	8.8748e+007	2.1570e-003	7.9809e+001
Pu-240	3.8575e-003	1.4273e+008	3.4690e-003	1.2835e+002
Pu-241	9.5132e-001	3.5199e+010	8.5550e-001	3.1653e+004
Rb-86	7.5127e+000	2.7797e+011	6.7560e+000	2.4997e+005
Rh-103m	4.2522e+001	1.5733e+012	3.8239e+001	1.4148e+006
Rh-105	2.7478e+001	1.0167e+012	2.4710e+001	9.1427e+005
Rh-106	1.6991e+001	6.2868e+011	1.5280e+001	5.6536e+005
Ru-103	4.2634e+001	1.5775e+012	3.8340e+001	1.4186e+006
Ru-105	2.5220e+001	9.3315e+011	2.2680e+001	8.3916e+005
Ru-106	1.6991e+001	6.2868e+011	1.5280e+001	5.6536e+005
Sb-127	4.6215e+001	1.7099e+012	4.1560e+001	1.5377e+006
Sb-129	1.4656e+002	5.4228e+012	1.3180e+002	4.8766e+006
Sr-89	2.0372e+002	7.5376e+012	1.8320e+002	6.7784e+006
Sr-90	2.5976e+001	9.6112e+011	2.3360e+001	8.6432e+005
Sr-91	2.4153e+002	8.9365e+012	2.1720e+002	8.0364e+006
Sr-92	2.1362e+002	7.9038e+012	1.9210e+002	7.1077e+006
Tc-99m	4.4335e+001	1.6404e+012	3.9870e+001	1.4752e+006
Te-127	4.6148e+001	1.7075e+012	4.1500e+001	1.5355e+006
Te-127m	7.8741e+000	2.9134e+011	7.0810e+000	2.6200e+005
Te-129	1.5590e+002	5.7684e+012	1.4020e+002	5.1874e+006
Te-129m	3.2982e+001	1.2203e+012	2.9660e+001	1.0974e+006
Te-131m	1.0409e+002	3.8515e+012	9.3610e+001	3.4636e+006
Te-132	7.5672e+002	2.7998e+013	6.8050e+002	2.5179e+007
Y-90	3.5273e-001	1.3051e+010	3.1720e-001	1.1736e+004
Y-91	2.6688e+000	9.8746e+010	2.4000e+000	8.8800e+004
Y-92	1.5390e+001	5.6943e+011	1.3840e+001	5.1208e+005
Y-93	1.9782e+000	7.3195e+010	1.7790e+000	6.5823e+004
Zr-95	3.8030e+000	1.4071e+011	3.4200e+000	1.2654e+005
Zr-97	3.6140e+000	1.3372e+011	3.2500e+000	1.2025e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.831e+08	0.000e+00	2.976e-28	0.000e+00	2.552e-29
0.02	3.217e+11	0.000e+00	8.224e-25	0.000e+00	2.849e-26
0.03	3.899e+13	1.054e-131	2.204e-22	1.044e-133	2.185e-24
0.04	1.063e+12	1.543e-64	1.594e-23	6.822e-67	7.049e-26
0.05	3.681e+12	2.629e-39	1.804e-22	7.004e-42	4.806e-25

DOS File: RHR1.MS5
Run Date: September 2, 2005
Run Time: 2:49:49 PM
Duration: 00:00:33

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.275e+12	1.064e-28	4.485e-22	2.114e-31	8.908e-25
0.08	4.855e+12	6.552e-19	6.301e-17	1.037e-21	9.971e-20
0.1	4.232e+12	2.865e-15	6.446e-13	4.383e-18	9.862e-16
0.15	1.401e+13	4.880e-11	2.155e-08	8.035e-14	3.549e-11
0.2	3.875e+13	7.443e-09	3.662e-06	1.314e-11	6.463e-09
0.3	3.693e+13	7.839e-07	2.656e-04	1.487e-09	5.038e-07
0.4	1.699e+14	7.511e-05	1.591e-02	1.463e-07	3.100e-05
0.5	3.789e+14	1.570e-03	2.213e-01	3.081e-06	4.343e-04
0.6	3.887e+14	9.287e-03	9.247e-01	1.813e-05	1.805e-03
0.8	5.746e+14	1.923e-01	1.108e+01	3.657e-04	2.107e-02
1.0	2.629e+14	6.109e-01	2.326e+01	1.126e-03	4.287e-02
1.5	2.211e+14	1.305e+01	2.497e+02	2.196e-02	4.202e-01
2.0	5.064e+13	2.216e+01	2.815e+02	3.427e-02	4.353e-01
3.0	3.038e+10	1.451e-01	1.118e+00	1.969e-04	1.517e-03
4.0	2.138e+09	4.155e-02	2.356e-01	5.140e-05	2.915e-04
TOTALS:	2.191e+15	3.622e+01	5.681e+02	5.800e-02	9.235e-01

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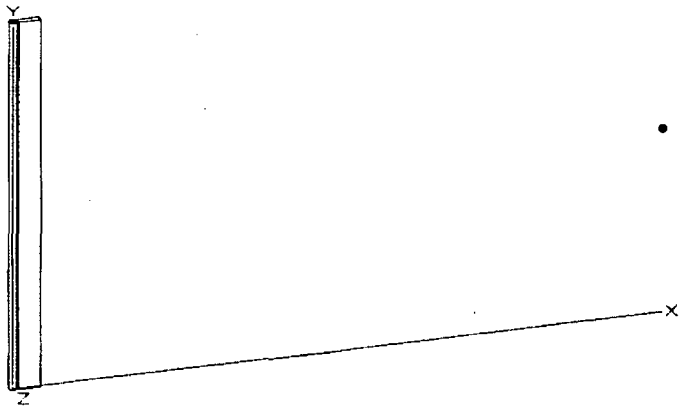
MicroShield v5.01 (5.01-00076)
Pennsylvania Power & Light Co.

Page : 1
DOS File: RHR2.MS5
Run Date: September 2, 2005
Run Time: 2:51:22 PM
Duration: 00:00:33

EC-RADN-1129
Page 456

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

Case Title: Control Room
Description: 142inch RHR - Time = 2 hour
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.5112e-003	5.5915e+007	1.3590e-003	5.0283e+001
Ba-137m	1.2161e+003	4.4994e+013	1.0936e+003	4.0462e+007
Ba-139	4.2434e+002	1.5701e+013	3.8160e+002	1.4119e+007
Ba-140	1.1598e+003	4.2913e+013	1.0430e+003	3.8591e+007
Ce-141	2.6710e+001	9.8828e+011	2.4020e+001	8.8874e+005
Ce-143	2.3786e+001	8.8007e+011	2.1390e+001	7.9143e+005
Ce-144	2.2462e+001	8.3111e+011	2.0200e+001	7.4740e+005
Cm-242	3.9532e-001	1.4627e+010	3.5550e-001	1.3154e+004
Cm-244	2.3174e-002	8.5744e+008	2.0840e-002	7.7108e+002
Co-58	4.4002e-001	1.6281e+010	3.9570e-001	1.4641e+004
Co-60	2.3697e-001	8.7678e+009	2.1310e-001	7.8847e+003
Cs-134	1.7069e+003	6.3156e+013	1.5350e+003	5.6795e+007
Cs-136	5.4277e+002	2.0082e+013	4.8810e+002	1.8060e+007
Cs-137	1.2855e+003	4.7562e+013	1.1560e+003	4.2772e+007
I-131	9.4631e+003	3.5014e+014	8.5100e+003	3.1487e+008
I-132	1.1039e+004	4.0844e+014	9.9270e+003	3.6730e+008
I-133	1.8526e+004	6.8546e+014	1.6660e+004	6.1642e+008
I-134	4.4958e+003	1.6635e+014	4.0430e+003	1.4959e+008
I-135	1.5246e+004	5.6408e+014	1.3710e+004	5.0727e+008
La-140	2.8089e+001	1.0393e+012	2.5260e+001	9.3462e+005
La-141	7.4282e+000	2.7484e+011	6.6800e+000	2.4716e+005
La-142	4.2134e+000	1.5589e+011	3.7890e+000	1.4019e+005
Mo-99	1.4701e+002	5.4392e+012	1.3220e+002	4.8914e+006
Nb-95	1.1409e+001	4.2214e+011	1.0260e+001	3.7962e+005

DOS File: RHR2.MS5
Run Date: September 2, 2005
Run Time: 2:51:22 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	4.2912e+000	1.5877e+011	3.8590e+000	1.4278e+005
Np-239	3.0758e+002	1.1380e+013	2.7660e+002	1.0234e+007
Pr-143	9.5888e+000	3.5478e+011	8.6230e+000	3.1905e+005
Pr-144	2.2141e+001	8.1922e+011	1.9911e+001	7.3671e+005
Pu-238	6.7710e-002	2.5053e+009	6.0890e-002	2.2529e+003
Pu-239	7.1924e-002	2.6612e+009	6.4680e-002	2.3932e+003
Pu-240	1.1565e-002	4.2790e+008	1.0400e-002	3.8480e+002
Pu-241	2.8523e+000	1.0553e+011	2.5650e+000	9.4905e+004
Rb-86	1.6068e+001	5.9453e+011	1.4450e+001	5.3465e+005
Rh-103m	1.2743e+002	4.7150e+012	1.1460e+002	4.2401e+006
Rh-105	8.2143e+001	3.0393e+012	7.3870e+001	2.7332e+006
Rh-106	5.0930e+001	1.8844e+012	4.5800e+001	1.6946e+006
Ru-103	1.2777e+002	4.7274e+012	1.1490e+002	4.2513e+006
Ru-105	6.4674e+001	2.3929e+012	5.8160e+001	2.1519e+006
Ru-106	5.0930e+001	1.8844e+012	4.5800e+001	1.6946e+006
Sb-127	1.3755e+002	5.0895e+012	1.2370e+002	4.5769e+006
Sb-129	3.7430e+002	1.3849e+013	3.3660e+002	1.2454e+007
Sr-89	6.1049e+002	2.2588e+013	5.4900e+002	2.0313e+007
Sr-90	7.7896e+001	2.8821e+012	7.0050e+001	2.5919e+006
Sr-91	6.7320e+002	2.4909e+013	6.0540e+002	2.2400e+007
Sr-92	4.9573e+002	1.8342e+013	4.4580e+002	1.6495e+007
Tc-99m	1.3266e+002	4.9085e+012	1.1930e+002	4.4141e+006
Te-127	1.3822e+002	5.1142e+012	1.2430e+002	4.5991e+006
Te-127m	2.3608e+001	8.7349e+011	2.1230e+001	7.8551e+005
Te-129	4.3057e+002	1.5931e+013	3.8720e+002	1.4326e+007
Te-129m	9.8868e+001	3.6581e+012	8.8910e+001	3.2897e+006
Te-131m	3.0502e+002	1.1286e+013	2.7430e+002	1.0149e+007
Te-132	2.2485e+003	8.3193e+013	2.0220e+003	7.4814e+007
Y-90	1.4723e+000	5.4475e+010	1.3240e+000	4.8988e+004
Y-91	8.0676e+000	2.9850e+011	7.2550e+000	2.6843e+005
Y-92	8.7792e+001	3.2483e+012	7.8950e+001	2.9212e+006
Y-93	5.5366e+000	2.0486e+011	4.9790e+000	1.8422e+005
Zr-95	1.1398e+001	4.2173e+011	1.0250e+001	3.7925e+005
Zr-97	1.0399e+001	3.8478e+011	9.3520e+000	3.4602e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	5.356e+08	0.000e+00	8.702e-28	0.000e+00	7.464e-29
0.02	9.594e+11	0.000e+00	2.453e-24	0.000e+00	8.496e-26
[illegible]3	9.978e+13	2.696e-131	5.641e-22	2.672e-133	5.591e-24
[illegible].04	2.556e+12	3.709e-64	3.832e-23	1.640e-66	1.695e-25
0.05	1.094e+13	7.812e-39	5.361e-22	2.081e-41	1.428e-24

DOS File: RHR2.MS5
Run Date: September 2, 2005
Run Time: 2:51:22 PM
Duration: 00:00:33

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.809e+12	2.345e-28	9.883e-22	4.658e-31	1.963e-24
0.08	1.094e+13	1.476e-18	1.420e-16	2.336e-21	2.247e-19
0.1	1.250e+13	8.458e-15	1.903e-12	1.294e-17	2.912e-15
0.15	2.318e+13	8.072e-11	3.565e-08	1.329e-13	5.870e-11
0.2	9.867e+13	1.895e-08	9.324e-06	3.345e-11	1.646e-08
0.3	7.964e+13	1.691e-06	5.727e-04	3.207e-09	1.086e-06
0.4	3.523e+14	1.558e-04	3.300e-02	3.035e-07	6.429e-05
0.5	7.947e+14	3.292e-03	4.641e-01	6.462e-06	9.109e-04
0.6	7.439e+14	1.777e-02	1.770e+00	3.469e-05	3.454e-03
0.8	8.916e+14	2.983e-01	1.719e+01	5.675e-04	3.269e-02
1.0	4.770e+14	1.108e+00	4.220e+01	2.043e-03	7.778e-02
1.5	4.305e+14	2.541e+01	4.862e+02	4.276e-02	8.181e-01
2.0	8.961e+13	3.922e+01	4.982e+02	6.065e-02	7.704e-01
3.0	7.973e+10	3.808e-01	2.934e+00	5.167e-04	3.980e-03
4.0	4.092e+09	7.951e-02	4.509e-01	9.836e-05	5.578e-04
TOTALS:	4.122e+15	6.652e+01	1.049e+03	1.067e-01	1.708e+00

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Page : 1
DOS File: RHR4.MS5
Run Date: September 2, 2005
Run Time: 2:53:01 PM
Duration: 00:00:33

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

Case Title: Control Room
Description: 12 inch RHR - Time = 4 hour
Geometry: 7 - Cylinder Volume - Side Shields

Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.5079e-003	5.5791e+007	1.3560e-003	5.0172e+001
Ba-137m	1.2129e+003	4.4877e+013	1.0907e+003	4.0357e+007
Ba-139	1.5479e+002	5.7272e+012	1.3920e+002	5.1504e+006
Ba-140	1.1520e+003	4.2625e+013	1.0360e+003	3.8332e+007
Ce-141	2.6610e+001	9.8458e+011	2.3930e+001	8.8541e+005
Ce-143	2.2752e+001	8.4181e+011	2.0460e+001	7.5702e+005
Ce-144	2.2407e+001	8.2905e+011	2.0150e+001	7.4555e+005
Cm-242	3.9420e-001	1.4586e+010	3.5450e-001	1.3117e+004
Cm-244	2.3118e-002	8.5538e+008	2.0790e-002	7.6923e+002
Co-58	4.3868e-001	1.6231e+010	3.9450e-001	1.4597e+004
Co-60	2.3641e-001	8.7472e+009	2.1260e-001	7.8662e+003
Cs-134	1.7025e+003	6.2991e+013	1.5310e+003	5.6647e+007
Cs-136	5.3899e+002	1.9942e+013	4.8470e+002	1.7934e+007
Cs-137	1.2821e+003	4.7439e+013	1.1530e+003	4.2661e+007
I-131	9.3742e+003	3.4684e+014	8.4300e+003	3.1191e+008
I-132	7.0479e+003	2.6077e+014	6.3380e+003	2.3451e+008
I-133	1.7292e+004	6.3979e+014	1.5550e+004	5.7535e+008
I-134	9.2252e+002	3.4133e+013	8.2960e+002	3.0695e+007
I-135	1.2332e+004	4.5629e+014	1.1090e+004	4.1033e+008
La-140	6.6153e+001	2.4477e+012	5.9490e+001	2.2011e+006
La-141	5.2075e+000	1.9268e+011	4.6830e+000	1.7327e+005
La-142	1.7103e+000	6.3279e+010	1.5380e+000	5.6906e+004
Mo-99	1.4356e+002	5.3117e+012	1.2910e+002	4.7767e+006
Nb-95	1.1376e+001	4.2090e+011	1.0230e+001	3.7851e+005

DOS File: RHR4.MS5
Run Date: September 2, 2005
Run Time: 2:53:01 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	4.2590e+000	1.5758e+011	3.8300e+000	1.4171e+005
Np-239	2.9935e+002	1.1076e+013	2.6920e+002	9.9604e+006
Pr-143	9.6232e+000	3.5606e+011	8.6540e+000	3.2020e+005
Pr-144	2.2086e+001	8.1720e+011	1.9862e+001	7.3489e+005
Pu-238	6.7543e-002	2.4991e+009	6.0740e-002	2.2474e+003
Pu-239	7.1768e-003	2.6554e+008	6.4540e-003	2.3880e+002
Pu-240	1.1531e-002	4.2666e+008	1.0370e-002	3.8369e+002
Pu-241	2.8456e+000	1.0529e+011	2.5590e+000	9.4683e+004
Rb-86	1.5979e+001	5.9124e+011	1.4370e+001	5.3169e+005
Rh-103m	1.2688e+002	4.6945e+012	1.1410e+002	4.2217e+006
Rh-105	8.0920e+001	2.9940e+012	7.2770e+001	2.6925e+006
Rh-106	5.0796e+001	1.8795e+012	4.5680e+001	1.6902e+006
Ru-103	1.2721e+002	4.7069e+012	1.1440e+002	4.2328e+006
Ru-105	4.7216e+001	1.7470e+012	4.2460e+001	1.5710e+006
Ru-106	5.0796e+001	1.8795e+012	4.5680e+001	1.6902e+006
Sb-127	1.3511e+002	4.9990e+012	1.2150e+002	4.4955e+006
Sb-129	2.7088e+002	1.0023e+013	2.4360e+002	9.0132e+006
Sr-89	6.0838e+002	2.2510e+013	5.4710e+002	2.0243e+007
Sr-90	7.7707e+001	2.8751e+012	6.9880e+001	2.5856e+006
Sr-91	5.8035e+002	2.1473e+013	5.2190e+002	1.9310e+007
Sr-92	2.9657e+002	1.0973e+013	2.6670e+002	9.8679e+006
Tc-99m	1.3155e+002	4.8673e+012	1.1830e+002	4.3771e+006
Te-127	1.3755e+002	5.0895e+012	1.2370e+002	4.5769e+006
Te-127m	2.3552e+001	8.7143e+011	2.1180e+001	7.8366e+005
Te-129	3.4728e+002	1.2849e+013	3.1230e+002	1.1555e+007
Te-129m	9.8579e+001	3.6474e+012	8.8650e+001	3.2801e+006
Te-131m	2.9045e+002	1.0747e+013	2.6120e+002	9.6644e+006
Te-132	2.2040e+003	8.1547e+013	1.9820e+003	7.3334e+007
Y-90	3.1025e+000	1.1479e+011	2.7900e+000	1.0323e+005
Y-91	8.2989e+000	3.0706e+011	7.4630e+000	2.7613e+005
Y-92	1.8381e+002	6.8011e+012	1.6530e+002	6.1161e+006
Y-93	4.8150e+000	1.7815e+011	4.3300e+000	1.6021e+005
Zr-95	1.1365e+001	4.2049e+011	1.0220e+001	3.7814e+005
Zr-97	9.5576e+000	3.5363e+011	8.5950e+000	3.1802e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	5.098e+08	0.000e+00	8.283e-28	0.000e+00	7.104e-29
0.02	9.467e+11	0.000e+00	2.420e-24	0.000e+00	8.384e-26
[illegible]3	9.420e+13	2.545e-131	5.326e-22	2.522e-133	5.278e-24
[illegible].04	2.463e+12	3.575e-64	3.693e-23	1.581e-66	1.633e-25
0.05	1.072e+13	7.658e-39	5.255e-22	2.040e-41	1.400e-24

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DOS File: RHR4.MS5
Run Date: September 2, 2005
Run Time: 2:53:01 PM
Duration: 00:00:33

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.783e+12	2.323e-28	9.790e-22	4.614e-31	1.944e-24
0.08	1.082e+13	1.460e-18	1.404e-16	2.311e-21	2.222e-19
0.1	1.216e+13	8.229e-15	1.852e-12	1.259e-17	2.833e-15
0.15	1.461e+13	5.089e-11	2.248e-08	8.380e-14	3.701e-11
0.2	9.049e+13	1.738e-08	8.551e-06	3.068e-11	1.509e-08
0.3	7.048e+13	1.496e-06	5.068e-04	2.838e-09	9.614e-07
0.4	3.233e+14	1.429e-04	3.028e-02	2.785e-07	5.899e-05
0.5	6.928e+14	2.870e-03	4.046e-01	5.634e-06	7.941e-04
0.6	5.074e+14	1.212e-02	1.207e+00	2.366e-05	2.356e-03
0.8	5.034e+14	1.684e-01	9.704e+00	3.204e-04	1.846e-02
1.0	3.338e+14	7.756e-01	2.953e+01	1.430e-03	5.443e-02
1.5	3.246e+14	1.916e+01	3.666e+02	3.224e-02	6.169e-01
2.0	6.220e+13	2.722e+01	3.458e+02	4.210e-02	5.347e-01
3.0	1.045e+11	4.991e-01	3.845e+00	6.772e-04	5.216e-03
4.0	1.661e+09	3.227e-02	1.830e-01	3.993e-05	2.264e-04
TOTALS:	3.057e+15	4.788e+01	7.573e+02	7.683e-02	1.233e+00

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

Page : 1
DOS File: RHR8.MS5
Run Date: September 2, 2005
Run Time: 2:55:13 PM
Duration: 00:00:33

EC-RADN-1129
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File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 12 inch RHR - Time = 8 hour
Geometry: 7 - Cylinder Volume - Side Shields

Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.5023e-003	5.5586e+007	1.3510e-003	4.9987e+001
Ba-137m	1.2066e+003	4.4644e+013	1.0851e+003	4.0147e+007
Ba-139	2.0616e+001	7.6281e+011	1.8540e+001	6.8598e+005
Ba-140	1.1354e+003	4.2008e+013	1.0210e+003	3.7777e+007
Ce-141	2.6399e+001	9.7676e+011	2.3740e+001	8.7838e+005
Ce-143	2.0817e+001	7.7022e+011	1.8720e+001	6.9264e+005
Ce-144	2.2284e+001	8.2453e+011	2.0040e+001	7.4148e+005
Cm-242	3.9209e-001	1.4507e+010	3.5260e-001	1.3046e+004
Cm-244	2.3007e-002	8.5127e+008	2.0690e-002	7.6553e+002
Co-58	4.3579e-001	1.6124e+010	3.9190e-001	1.4500e+004
Co-60	2.3519e-001	8.7020e+009	2.1150e-001	7.8255e+003
Cs-134	1.6947e+003	6.2703e+013	1.5240e+003	5.6388e+007
Cs-136	5.3176e+002	1.9675e+013	4.7820e+002	1.7693e+007
Cs-137	1.2755e+003	4.7192e+013	1.1470e+003	4.2439e+007
I-131	9.1985e+003	3.4034e+014	8.2720e+003	3.0606e+008
I-132	3.6273e+003	1.3421e+014	3.2620e+003	1.2069e+008
I-133	1.5056e+004	5.5709e+014	1.3540e+004	5.0098e+008
I-134	3.8842e+001	1.4372e+012	3.4930e+001	1.2924e+006
I-135	8.0653e+003	2.9842e+014	7.2530e+003	2.6836e+008
La-140	1.3744e+002	5.0854e+012	1.2360e+002	4.5732e+006
La-141	2.5598e+000	9.4713e+010	2.3020e+000	8.5174e+004
La-142	2.8178e-001	1.0426e+010	2.5340e-001	9.3758e+003
Mo-99	1.3700e+002	5.0689e+012	1.2320e+002	4.5584e+006
Nb-95	1.1320e+001	4.1885e+011	1.0180e+001	3.7666e+005

DOS File: RHR8.MS5
Run Date: September 2, 2005
Run Time: 2:55:13 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	4.1934e+000	1.5515e+011	3.7710e+000	1.3953e+005
Np-239	2.8367e+002	1.0496e+013	2.5510e+002	9.4387e+006
Pr-143	9.6800e+000	3.5816e+011	8.7050e+000	3.2209e+005
Pr-144	2.1966e+001	8.1274e+011	1.9753e+001	7.3088e+005
Pu-238	6.7220e-002	2.4872e+009	6.0450e-002	2.2367e+003
Pu-239	7.1457e-003	2.6439e+008	6.4260e-003	2.3776e+002
Pu-240	1.1476e-002	4.2461e+008	1.0320e-002	3.8184e+002
Pu-241	2.8312e+000	1.0475e+011	2.5460e+000	9.4202e+004
Rb-86	1.5802e+001	5.8466e+011	1.4210e+001	5.2577e+005
Rh-103m	1.2588e+002	4.6576e+012	1.1320e+002	4.1885e+006
Rh-105	7.7084e+001	2.8521e+012	6.9320e+001	2.5648e+006
Rh-106	5.0529e+001	1.8696e+012	4.5440e+001	1.6813e+006
Ru-103	1.2621e+002	4.6698e+012	1.1350e+002	4.1995e+006
Ru-105	2.5165e+001	9.3109e+011	2.2630e+001	8.3731e+005
Ru-106	5.0529e+001	1.8696e+012	4.5440e+001	1.6813e+006
Sb-127	1.3055e+002	4.8303e+012	1.1740e+002	4.3438e+006
Sb-129	1.4189e+002	5.2500e+012	1.2760e+002	4.7212e+006
Sr-89	6.0404e+002	2.2349e+013	5.4320e+002	2.0098e+007
Sr-90	7.7328e+001	2.8612e+012	6.9540e+001	2.5730e+006
Sr-91	4.3134e+002	1.5960e+013	3.8790e+002	1.4352e+007
Sr-92	1.0608e+002	3.9251e+012	9.5400e+001	3.5298e+006
Tc-99m	1.2821e+002	4.7439e+012	1.1530e+002	4.2661e+006
Te-127	1.3566e+002	5.0196e+012	1.2200e+002	4.5140e+006
Te-127m	2.3441e+001	8.6732e+011	2.1080e+001	7.7996e+005
Te-129	2.1840e+002	8.0807e+012	1.9640e+002	7.2668e+006
Te-129m	9.7912e+001	3.6227e+012	8.8050e+001	3.2578e+006
Te-131m	2.6354e+002	9.7511e+012	2.3700e+002	8.7690e+006
Te-132	2.1172e+003	7.8338e+013	1.9040e+003	7.0448e+007
Y-90	6.2372e+000	2.3078e+011	5.6090e+000	2.0753e+005
Y-91	8.6569e+000	3.2031e+011	7.7850e+000	2.8805e+005
Y-92	1.7836e+002	6.5995e+012	1.6040e+002	5.9348e+006
Y-93	3.6418e+000	1.3475e+011	3.2750e+000	1.2117e+005
Zr-95	1.1287e-001	4.1761e+009	1.0150e-001	3.7555e+003
Zr-97	8.0720e+000	2.9866e+011	7.2590e+000	2.6858e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.678e+08	0.000e+00	7.600e-28	0.000e+00	6.519e-29
0.02	9.216e+11	0.000e+00	2.356e-24	0.000e+00	8.162e-26
0.03	8.847e+13	2.390e-131	5.002e-22	2.369e-133	4.957e-24
0.04	2.376e+12	3.448e-64	3.562e-23	1.525e-66	1.576e-25
0.05	1.030e+13	7.356e-39	5.048e-22	1.960e-41	1.345e-24

DOS File: RHR8.MS5
Run Date: September 2, 2005
Run Time: 2:55:13 PM
Duration: 00:00:33

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.732e+12	2.281e-28	9.612e-22	4.530e-31	1.909e-24
0.08	1.059e+13	1.429e-18	1.374e-16	2.261e-21	2.174e-19
0.1	1.152e+13	7.799e-15	1.755e-12	1.193e-17	2.685e-15
0.15	1.161e+13	4.043e-11	1.786e-08	6.657e-14	2.940e-11
0.2	8.271e+13	1.589e-08	7.816e-06	2.804e-11	1.380e-08
0.3	6.017e+13	1.277e-06	4.327e-04	2.423e-09	8.207e-07
0.4	3.018e+14	1.335e-04	2.827e-02	2.600e-07	5.508e-05
0.5	5.725e+14	2.372e-03	3.343e-01	4.656e-06	6.563e-04
0.6	3.296e+14	7.875e-03	7.842e-01	1.537e-05	1.531e-03
0.8	3.015e+14	1.009e-01	5.813e+00	1.919e-04	1.106e-02
1.0	2.116e+14	4.917e-01	1.872e+01	9.063e-04	3.451e-02
1.5	2.084e+14	1.230e+01	2.354e+02	2.070e-02	3.960e-01
2.0	3.793e+13	1.660e+01	2.109e+02	2.567e-02	3.261e-01
3.0	1.839e+11	8.786e-01	6.768e+00	1.192e-03	9.182e-03
4.0	2.737e+08	5.317e-03	3.016e-02	6.578e-06	3.731e-05
TOTALS:	2.245e+15	3.039e+01	4.787e+02	4.869e-02	7.791e-01

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

Page : 1
DOS File: RHR16.MS5
Run Date: September 2, 2005
Run Time: 2:50:23 PM
Duration: 00:00:33

EC-RADN-1129
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File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 12 inch RHR - Time = 16 hour
Geometry: 7 - Cylinder Volume - Side Shields

Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.4923e-003	5.5215e+007	1.3420e-003	4.9654e+001
Ba-137m	1.1950e+003	4.4216e+013	1.0747e+003	3.9762e+007
Ba-139	3.6529e-001	1.3516e+010	3.2850e-001	1.2155e+004
Ba-140	1.1044e+003	4.0864e+013	9.9320e+002	3.6748e+007
Ce-141	2.5965e+001	9.6071e+011	2.3350e+001	8.6395e+005
Ce-143	1.7425e+001	6.4473e+011	1.5670e+001	5.7979e+005
Ce-144	2.2051e+001	8.1589e+011	1.9830e+001	7.3371e+005
Cm-242	3.8775e-001	1.4347e+010	3.4870e-001	1.2902e+004
Cm-244	2.2785e-002	8.4304e+008	2.0490e-002	7.5813e+002
Co-58	4.3023e-001	1.5919e+010	3.8690e-001	1.4315e+004
Co-60	2.3296e-001	8.6197e+009	2.0950e-001	7.7515e+003
Cs-134	1.6780e+003	6.2086e+013	1.5090e+003	5.5833e+007
Cs-136	5.1741e+002	1.9144e+013	4.6530e+002	1.7216e+007
Cs-137	1.2632e+003	4.6740e+013	1.1360e+003	4.2032e+007
I-131	8.8571e+003	3.2771e+014	7.9650e+003	2.9470e+008
I-132	2.3408e+003	8.6608e+013	2.1050e+003	7.7885e+007
I-133	1.1420e+004	4.2255e+014	1.0270e+004	3.7999e+008
I-134	6.8877e-002	2.5485e+009	6.1940e-002	2.2918e+003
I-135	3.4516e+003	1.2771e+014	3.1040e+003	1.1485e+008
La-140	2.6243e+002	9.7100e+012	2.3600e+002	8.7320e+006
La-141	6.1816e-001	2.2872e+010	5.5590e-001	2.0568e+004
La-142	7.6483e-003	2.8299e+008	6.8780e-003	2.5449e+002
Mo-99	1.2477e+002	4.6164e+012	1.1220e+002	4.1514e+006
Nb-95	1.1220e+001	4.1514e+011	1.0090e+001	3.7333e+005

DOS File: RHR16.MS5
Run Date: September 2, 2005
Run Time: 2:50:23 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	4.0666e+000	1.5046e+011	3.6570e+000	1.3531e+005
Np-239	2.5465e+002	9.4220e+012	2.2900e+002	8.4730e+006
Pr-143	9.7445e+000	3.6054e+011	8.7630e+000	3.2423e+005
Pr-144	2.1736e+001	8.0422e+011	1.9546e+001	7.2322e+005
Pu-238	6.6575e-002	2.4633e+009	5.9870e-002	2.2152e+003
Pu-239	7.0846e-003	2.6213e+008	6.3710e-003	2.3573e+002
Pu-240	1.1365e-002	4.2049e+008	1.0220e-002	3.7814e+002
Pu-241	2.8034e+000	1.0372e+011	2.5210e+000	9.3277e+004
Rb-86	1.5457e+001	5.7190e+011	1.3900e+001	5.1430e+005
Rh-103m	1.2399e+002	4.5878e+012	1.1151e+002	4.1257e+006
Rh-105	6.7298e+001	2.4900e+012	6.0520e+001	2.2392e+006
Rh-106	5.0007e+001	1.8502e+012	4.4970e+001	1.6639e+006
Ru-103	1.2432e+002	4.5999e+012	1.1180e+002	4.1366e+006
Ru-105	7.1479e+000	2.6447e+011	6.4280e+000	2.3784e+005
Ru-106	5.0007e+001	1.8502e+012	4.4970e+001	1.6639e+006
Sb-127	1.2176e+002	4.5053e+012	1.0950e+002	4.0515e+006
Sb-129	3.8931e+001	1.4405e+012	3.5010e+001	1.2954e+006
Sr-89	5.9536e+002	2.2028e+013	5.3540e+002	1.9810e+007
Sr-90	7.6583e+001	2.8336e+012	6.8870e+001	2.5482e+006
Sr-91	2.3830e+002	8.8172e+012	2.1430e+002	7.9291e+006
Sr-92	1.3578e+001	5.0237e+011	1.2210e+001	4.5177e+005
Tc-99m	1.2121e+002	4.4847e+012	1.0900e+002	4.0330e+006
Te-127	1.3133e+002	4.8591e+012	1.1810e+002	4.3697e+006
Te-127m	2.3207e+001	8.5868e+011	2.0870e+001	7.7219e+005
Te-129	1.3211e+002	4.8879e+012	1.1880e+002	4.3956e+006
Te-129m	9.6422e+001	3.5676e+012	8.6710e+001	3.2083e+006
Te-131m	2.1695e+002	8.0272e+012	1.9510e+002	7.2187e+006
Te-132	1.9527e+003	7.2249e+013	1.7560e+003	6.4972e+007
Y-90	1.2032e+001	4.4518e+011	1.0820e+001	4.0034e+005
Y-91	9.0750e+000	3.3578e+011	8.1610e+000	3.0196e+005
Y-92	6.5330e+001	2.4172e+012	5.8750e+001	2.1738e+006
Y-93	2.0828e+000	7.7063e+010	1.8730e+000	6.9301e+004
Zr-95	1.1131e+001	4.1185e+011	1.0010e+001	3.7037e+005
Zr-97	5.7579e+000	2.1304e+011	5.1780e+000	1.9159e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	4.112e+08	0.000e+00	6.681e-28	0.000e+00	5.731e-29
0.02	8.772e+11	0.000e+00	2.243e-24	0.000e+00	7.769e-26
0.03	8.132e+13	2.197e-131	4.598e-22	2.178e-133	4.557e-24
0.04	2.270e+12	3.294e-64	3.403e-23	1.457e-66	1.505e-25
0.05	9.500e+12	6.785e-39	4.656e-22	1.808e-41	1.240e-24

DOS File: RHR16.MS5
Run Date: September 2, 2005
Run Time: 2:50:23 PM
Duration: 00:00:33

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.635e+12	2.199e-28	9.269e-22	4.368e-31	1.841e-24
0.08	1.015e+13	1.369e-18	1.317e-16	2.167e-21	2.084e-19
0.1	1.037e+13	7.017e-15	1.579e-12	1.074e-17	2.416e-15
0.15	1.080e+13	3.760e-11	1.661e-08	6.192e-14	2.735e-11
0.2	7.305e+13	1.403e-08	6.903e-06	2.476e-11	1.218e-08
0.3	5.085e+13	1.079e-06	3.657e-04	2.047e-09	6.936e-07
0.4	2.803e+14	1.240e-04	2.626e-02	2.415e-07	5.116e-05
0.5	4.292e+14	1.778e-03	2.506e-01	3.490e-06	4.919e-04
0.6	2.613e+14	6.244e-03	6.217e-01	1.219e-05	1.214e-03
0.8	2.248e+14	7.521e-02	4.333e+00	1.431e-04	8.242e-03
1.0	1.173e+14	2.726e-01	1.038e+01	5.024e-04	1.913e-02
1.5	1.054e+14	6.221e+00	1.190e+02	1.047e-02	2.003e-01
2.0	1.735e+13	7.595e+00	9.648e+01	1.174e-02	1.492e-01
3.0	3.458e+11	1.652e+00	1.272e+01	2.241e-03	1.726e-02
4.0	7.428e+06	1.443e-04	8.185e-04	1.786e-07	1.013e-06
TOTALS:	1.688e+15	1.582e+01	2.438e+02	2.511e-02	3.958e-01

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

Page : 1
DOS File: RHR24.MS5
Date: September 2, 2005
Time: 2:51:56 PM
Duration: 00:00:33

EC-RADN-1129
Page 468

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

Case Title: Control Room
Description: 12 inch RHR - Time = 24 hour
Geometry: 7 - Cylinder Volume - Side Shields

Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.4823e-003	5.4845e+007	1.3330e-003	4.9321e+001
Ba-137m	1.1834e+003	4.3788e+013	1.0643e+003	3.9377e+007
Ba-139	6.4752e-003	2.3958e+008	5.8230e-003	2.1545e+002
Ba-140	1.0741e+003	3.9741e+013	9.6590e+002	3.5738e+007
Ce-141	2.5532e+001	9.4467e+011	2.2960e+001	8.4952e+005
Ce-143	1.4589e+001	5.3981e+011	1.3120e+001	4.8544e+005
Ce-144	2.1829e+001	8.0766e+011	1.9630e+001	7.2631e+005
Cm-242	3.8342e-001	1.4186e+010	3.4480e-001	1.2758e+004
Cm-244	2.2562e-002	8.3481e+008	2.0290e-002	7.5073e+002
Co-58	4.2467e-001	1.5713e+010	3.8190e-001	1.4130e+004
Co-60	2.3063e-001	8.5333e+009	2.0740e-001	7.6738e+003
Cs-134	1.6602e+003	6.1428e+013	1.4930e+003	5.5241e+007
Cs-136	5.0340e+002	1.8626e+013	4.5270e+002	1.6750e+007
Cs-137	1.2510e+003	4.6287e+013	1.1250e+003	4.1625e+007
I-131	8.5279e+003	3.1553e+014	7.6690e+003	2.8375e+008
I-132	2.1517e+003	7.9614e+013	1.9350e+003	7.1595e+007
I-133	8.6669e+003	3.2068e+014	7.7940e+003	2.8838e+008
I-134	1.2210e-004	4.5176e+006	1.0980e-004	4.0626e+000
I-135	1.4778e+003	5.4680e+013	1.3290e+003	4.9173e+007
La-140	3.6707e+002	1.3582e+013	3.3010e+002	1.2214e+007
La-141	1.4934e-001	5.5256e+009	1.3430e-001	4.9691e+003
La-142	2.0761e-004	7.6816e+006	1.8670e-004	6.9079e+000
Mo-99	1.1354e+002	4.2008e+012	1.0210e+002	3.7777e+006
Nb-95	1.1104e+001	4.1086e+011	9.9860e+000	3.6948e+005

DOS File: RHR24.MS5
Run Date: September 2, 2005
Run Time: 2:51:56 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	3.9432e+000	1.4590e+011	3.5460e+000	1.3120e+005
Np-239	2.2863e+002	8.4592e+012	2.0560e+002	7.6072e+006
Pr-143	9.7567e+000	3.6100e+011	8.7740e+000	3.2464e+005
Pr-144	2.1516e+001	7.9611e+011	1.9349e+001	7.1592e+005
Pu-238	6.5930e-002	2.4394e+009	5.9290e-002	2.1937e+003
Pu-239	7.0223e-003	2.5982e+008	6.3150e-003	2.3366e+002
Pu-240	1.1265e-002	4.1679e+008	1.0130e-002	3.7481e+002
Pu-241	2.7767e+000	1.0274e+011	2.4970e+000	9.2389e+004
Rb-86	1.5112e+001	5.5915e+011	1.3590e+001	5.0283e+005
Rh-103m	1.2211e+002	4.5180e+012	1.0981e+002	4.0630e+006
Rh-105	5.7557e+001	2.1296e+012	5.1760e+001	1.9151e+006
Rh-106	4.9495e+001	1.8313e+012	4.4510e+001	1.6469e+006
Ru-103	1.2243e+002	4.5300e+012	1.1010e+002	4.0737e+006
Ru-105	2.0305e+000	7.5129e+010	1.8260e+000	6.7562e+004
Ru-106	4.9495e+001	1.8313e+012	4.4510e+001	1.6469e+006
Sb-127	1.1354e+002	4.2008e+012	1.0210e+002	3.7777e+006
Sb-129	1.0681e+001	3.9519e+011	9.6050e+000	3.5538e+005
Sr-89	5.8691e+002	2.1716e+013	5.2780e+002	1.9529e+007
Sr-90	7.5838e+001	2.8060e+012	6.8200e+001	2.5234e+006
Sr-91	1.3166e+002	4.8714e+012	1.1840e+002	4.3808e+006
Sr-92	1.7369e+000	6.4267e+010	1.5620e+000	5.7794e+004
Tc-99m	1.1387e+002	4.2131e+012	1.0240e+002	3.7888e+006
Te-127	1.2677e+002	4.6904e+012	1.1400e+002	4.2180e+006
Te-127m	2.2985e+001	8.5045e+011	2.0670e+001	7.6479e+005
Te-129	9.7033e+001	3.5902e+012	8.7260e+001	3.2286e+006
Te-129m	9.4865e+001	3.5100e+012	8.5310e+001	3.1565e+006
Te-131m	1.7859e+002	6.6077e+012	1.6060e+002	5.9422e+006
Te-132	1.8014e+003	6.6653e+013	1.6200e+003	5.9940e+007
Y-90	1.7258e+001	6.3855e+011	1.5520e+001	5.7424e+005
Y-91	9.2485e+000	3.4219e+011	8.3170e+000	3.0773e+005
Y-92	1.7369e+001	6.4267e+011	1.5620e+001	5.7794e+005
Y-93	1.1910e+000	4.4065e+010	1.0710e+000	3.9627e+004
Zr-95	1.0988e+001	4.0654e+011	9.8810e+000	3.6560e+005
Zr-97	4.1077e+000	1.5199e+011	3.6940e+000	1.3668e+005

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.771e+08	0.000e+00	6.126e-28	0.000e+00	5.255e-29
0.02	8.359e+11	0.000e+00	2.137e-24	0.000e+00	7.403e-26
0.03	7.560e+13	2.043e-131	4.274e-22	2.024e-133	4.236e-24
0.04	2.180e+12	3.163e-64	3.268e-23	1.399e-66	1.445e-25
0.05	8.765e+12	6.260e-39	4.296e-22	1.668e-41	1.144e-24

DOS File: RHR24.MS5
Run Date: September 2, 2005
Run Time: 2:51:56 PM
Duration: 00:00:33

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.543e+12	2.122e-28	8.945e-22	4.216e-31	1.777e-24
0.08	9.732e+12	1.313e-18	1.263e-16	2.078e-21	1.999e-19
0.1	9.344e+12	6.325e-15	1.423e-12	9.676e-18	2.178e-15
0.15	1.030e+13	3.587e-11	1.584e-08	5.907e-14	2.609e-11
0.2	6.610e+13	1.270e-08	6.247e-06	2.241e-11	1.103e-08
0.3	4.643e+13	9.856e-07	3.339e-04	1.870e-09	6.334e-07
0.4	2.658e+14	1.175e-04	2.490e-02	2.290e-07	4.851e-05
0.5	3.325e+14	1.377e-03	1.942e-01	2.704e-06	3.811e-04
0.6	2.475e+14	5.913e-03	5.888e-01	1.154e-05	1.149e-03
0.8	2.014e+14	6.738e-02	3.882e+00	1.282e-04	7.384e-03
1.0	7.976e+13	1.853e-01	7.056e+00	3.416e-04	1.301e-02
1.5	6.513e+13	3.845e+00	7.356e+01	6.469e-03	1.238e-01
2.0	9.038e+12	3.956e+00	5.025e+01	6.117e-03	7.770e-02
3.0	4.836e+11	2.310e+00	1.779e+01	3.134e-03	2.414e-02
4.0	2.016e+05	3.918e-06	2.222e-05	4.847e-09	2.749e-08
TOTALS:	1.433e+15	1.037e+01	1.534e+02	1.620e-02	2.476e-01

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Pennsylvania Power & Light Co.

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DOS File: RHR48.MS5
Run Date: September 2, 2005
Run Time: 2:53:35 PM
Duration: 00:00:33

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

Case Title: Control Room
Description: 12 inch RHR - Time = 48 hour
Geometry: 7 - Cylinder Volume - Side Shields

Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.4512e-003	5.3693e+007	1.3050e-003	4.8285e+001
Ba-137m	1.1498e+003	4.2542e+013	1.0340e+003	3.8257e+007
Ba-139	3.6051e-008	1.3339e+003	3.2420e-008	1.1995e-003
Ba-140	9.8801e+002	3.6556e+013	8.8850e+002	3.2874e+007
Ce-141	2.4275e+001	8.9817e+011	2.1830e+001	8.0771e+005
Ce-143	8.5591e+000	3.1669e+011	7.6970e+000	2.8479e+005
Ce-144	2.1150e+001	7.8256e+011	1.9020e+001	7.0374e+005
Cm-242	3.7085e-001	1.3722e+010	3.3350e-001	1.2339e+004
Cm-244	2.1918e-002	8.1095e+008	1.9710e-002	7.2927e+002
Co-58	4.0844e-001	1.5112e+010	3.6730e-001	1.3590e+004
Co-60	2.2396e-001	8.2864e+009	2.0140e-001	7.4518e+003
Cs-134	1.6113e+003	5.9618e+013	1.4490e+003	5.3613e+007
Cs-136	4.6370e+002	1.7157e+013	4.1700e+002	1.5429e+007
Cs-137	1.2154e+003	4.4970e+013	1.0930e+003	4.0441e+007
I-131	7.6072e+003	2.8147e+014	6.8410e+003	2.5312e+008
I-132	1.6880e+003	6.2457e+013	1.5180e+003	5.6166e+007
I-133	3.7830e+003	1.3997e+014	3.4020e+003	1.2587e+008
I-134	6.8077e-013	2.5188e-002	6.1220e-013	2.2651e-008
I-135	1.1587e+002	4.2872e+012	1.0420e+002	3.8554e+006
La-140	5.8180e+002	2.1527e+013	5.2320e+002	1.9358e+007
La-141	2.1039e-003	7.7844e+007	1.8920e-003	7.0004e+001
La-142	4.1522e-009	1.5363e+002	3.7340e-009	1.3816e-004
Mo-99	8.5735e+001	3.1722e+012	7.7100e+001	2.8527e+006
Nb-95	1.0780e+001	3.9885e+011	9.6940e+000	3.5868e+005

DOS File: RHR48.MS5
Run Date: September 2, 2005
Run Time: 2:53:35 PM
Duration: 00:00:33

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	3.5962e+000	1.3306e+011	3.2340e+000	1.1966e+005
Np-239	1.6547e+002	6.1222e+012	1.4880e+002	5.5056e+006
Pr-143	9.5576e+000	3.5363e+011	8.5950e+000	3.1802e+005
Pr-144	2.0848e+001	7.7137e+011	1.8748e+001	6.9368e+005
Pu-238	6.4040e-002	2.3695e+009	5.7590e-002	2.1308e+003
Pu-239	6.8355e-003	2.5291e+008	6.1470e-003	2.2744e+002
Pu-240	1.0937e-002	4.0465e+008	9.8350e-003	3.6389e+002
Pu-241	2.6966e+000	9.9774e+010	2.4250e+000	8.9725e+004
Rb-86	1.4145e+001	5.2335e+011	1.2720e+001	4.7064e+005
Rh-103m	1.1645e+002	4.3088e+012	1.0472e+002	3.8748e+006
Rh-105	3.5095e+001	1.2985e+012	3.1560e+001	1.1677e+006
Rh-106	4.7983e+001	1.7754e+012	4.3150e+001	1.5965e+006
Ru-103	1.1676e+002	4.3201e+012	1.0500e+002	3.8850e+006
Ru-105	4.6526e-002	1.7215e+009	4.1840e-002	1.5481e+003
Ru-106	4.7983e+001	1.7754e+012	4.3150e+001	1.5965e+006
Sb-127	9.2107e+001	3.4080e+012	8.2830e+001	3.0647e+006
Sb-129	2.2051e-001	8.1589e+009	1.9830e-001	7.3371e+003
Sr-89	5.6234e+002	2.0807e+013	5.0570e+002	1.8711e+007
Sr-90	7.3648e+001	2.7250e+012	6.6230e+001	2.4505e+006
Sr-91	2.2196e+001	8.2123e+011	1.9960e+001	7.3852e+005
Sr-92	3.6418e-003	1.3475e+008	3.2750e-003	1.2117e+002
Tc-99m	8.7737e+001	3.2463e+012	7.8900e+001	2.9193e+006
Te-127	1.0920e+002	4.0403e+012	9.8200e+001	3.6334e+006
Te-127m	2.2296e+001	8.2494e+011	2.0050e+001	7.4185e+005
Te-129	7.8363e+001	2.8994e+012	7.0470e+001	2.6074e+006
Te-129m	9.0272e+001	3.3401e+012	8.1180e+001	3.0037e+006
Te-131m	9.9624e+001	3.6861e+012	8.9590e+001	3.3148e+006
Te-132	1.4145e+003	5.2335e+013	1.2720e+003	4.7064e+007
Y-90	2.9879e+001	1.1055e+012	2.6870e+001	9.9419e+005
Y-91	9.1751e+000	3.3948e+011	8.2510e+000	3.0529e+005
Y-92	1.9582e-001	7.2455e+009	1.7610e-001	6.5157e+003
Y-93	2.2284e-001	8.2453e+009	2.0040e-001	7.4148e+003
Zr-95	1.0557e+001	3.9062e+011	9.4940e+000	3.5128e+005
Zr-97	1.4912e+000	5.5174e+010	1.3410e+000	4.9617e+004

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.340e+08	0.000e+00	5.426e-28	0.000e+00	4.654e-29
0.02	7.114e+11	0.000e+00	1.819e-24	0.000e+00	6.300e-26
0.03	6.205e+13	1.676e-131	3.508e-22	1.661e-133	3.477e-24
0.04	1.961e+12	2.845e-64	2.940e-23	1.258e-66	1.300e-25
0.05	6.884e+12	4.917e-39	3.374e-22	1.310e-41	8.989e-25

DOS File: RHR48.MS5
Run Date: September 2, 2005
Run Time: 2:53:35 PM
Duration: 00:00:33

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.296e+12	1.917e-28	8.077e-22	3.807e-31	1.604e-24
0.08	8.620e+12	1.163e-18	1.119e-16	1.841e-21	1.770e-19
0.1	6.879e+12	4.657e-15	1.048e-12	7.124e-18	1.603e-15
0.15	8.794e+12	3.062e-11	1.352e-08	5.043e-14	2.227e-11
0.2	5.126e+13	9.846e-09	4.844e-06	1.738e-11	8.550e-09
0.3	4.022e+13	8.538e-07	2.893e-04	1.620e-09	5.487e-07
0.4	2.340e+14	1.035e-04	2.192e-02	2.016e-07	4.270e-05
0.5	1.662e+14	6.886e-04	9.707e-02	1.352e-06	1.905e-04
0.6	2.159e+14	5.158e-03	5.136e-01	1.007e-05	1.002e-03
0.8	1.617e+14	5.409e-02	3.117e+00	1.029e-04	5.928e-03
1.0	4.615e+13	1.072e-01	4.083e+00	1.977e-04	7.525e-03
1.5	3.793e+13	2.239e+00	4.284e+01	3.768e-03	7.208e-02
2.0	2.866e+12	1.254e+00	1.593e+01	1.940e-03	2.464e-02
3.0	7.665e+11	3.661e+00	2.820e+01	4.967e-03	3.826e-02
4.0	4.033e+00	7.836e-11	4.444e-10	9.694e-14	5.497e-13
TOTALS:	1.055e+15	7.322e+00	9.481e+01	1.099e-02	1.497e-01

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

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DOS File: RHR96.MS5
Run Date: September 2, 2005
Run Time: 2:55:47 PM
Duration: 00:00:32

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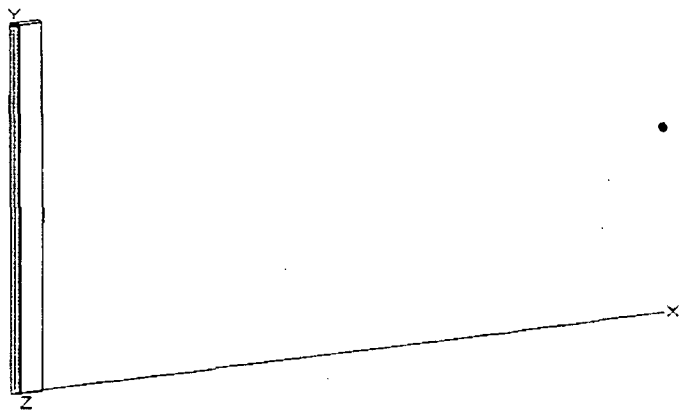
File Ref: _____
Date: _____
By: _____
Checked: _____

Case Title: Control Room
Description: 12 inch RHR - Time = 96 hour
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.3911e-003	5.1471e+007	1.2510e-003	4.6287e+001
Ba-137m	1.0846e+003	4.0129e+013	9.7533e+002	3.6087e+007
Ba-139				
Ba-140	8.3589e+002	3.0928e+013	7.5170e+002	2.7813e+007
Ce-141	2.1951e+001	8.1218e+011	1.9740e+001	7.3038e+005
Ce-143	2.9457e+000	1.0899e+011	2.6490e+000	9.8013e+004
Ce-144	1.9849e+001	7.3442e+011	1.7850e+001	6.6045e+005
Cm-242	3.4683e-001	1.2833e+010	3.1190e-001	1.1540e+004
Cm-244	2.0661e-002	7.6446e+008	1.8580e-002	6.8746e+002
Co-58	3.7775e-001	1.3977e+010	3.3970e-001	1.2569e+004
Co-60	2.1106e-001	7.8091e+009	1.8980e-001	7.0226e+003
Cs-134	1.5179e+003	5.6162e+013	1.3650e+003	5.0505e+007
Cs-136	3.9354e+002	1.4561e+013	3.5390e+002	1.3094e+007
Cs-137	1.1465e+003	4.2419e+013	1.0310e+003	3.8147e+007
I-131	6.0459e+003	2.2370e+014	5.4370e+003	2.0117e+008
I-132	1.0407e+003	3.8507e+013	9.3590e+002	3.4628e+007
I-133	7.2080e+002	2.6670e+013	6.4820e+002	2.3983e+007
I-134				
I-135	7.1212e-001	2.6349e+010	6.4040e-001	2.3695e+004
La-140	7.3737e+002	2.7283e+013	6.6310e+002	2.4535e+007
La-141	4.1789e-007	1.5462e+004	3.7580e-007	1.3905e-002
La-142				
Mo-99	4.8850e+001	1.8075e+012	4.3930e+001	1.6254e+006
Nb-95	1.0154e+001	3.7569e+011	9.1310e+000	3.3785e+005

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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.9891e+000	1.1060e+011	2.6880e+000	9.9456e+004
Np-239	8.6625e+001	3.2051e+012	7.7900e+001	2.8823e+006
Pr-143	8.6302e+000	3.1932e+011	7.7610e+000	2.8716e+005
Pr-144	1.9565e+001	7.2392e+011	1.7595e+001	6.5101e+005
Pu-238	6.0426e-002	2.2358e+009	5.4340e-002	2.0106e+003
Pu-239	6.4663e-003	2.3925e+008	5.8150e-003	2.1516e+002
Pu-240	1.0316e-002	3.8169e+008	9.2770e-003	3.4325e+002
Pu-241	2.5431e+000	9.4096e+010	2.2870e+000	8.4619e+004
Rb-86	1.2388e+001	4.5834e+011	1.1140e+001	4.1218e+005
Rh-103m	1.0606e+002	3.9243e+012	9.5378e+001	3.5290e+006
Rh-105	1.2921e+001	4.7809e+011	1.1620e+001	4.2994e+005
Rh-106	4.5092e+001	1.6684e+012	4.0550e+001	1.5004e+006
Ru-103	1.0634e+002	3.9346e+012	9.5630e+001	3.5383e+006
Ru-105	2.4431e-005	9.0393e+005	2.1970e-005	8.1289e-001
Ru-106	4.5092e+001	1.6684e+012	4.0550e+001	1.5004e+006
Sb-127	6.0615e+001	2.2428e+012	5.4510e+001	2.0169e+006
Sb-129	9.4064e-005	3.4804e+006	8.4590e-005	3.1298e+000
Sr-89	5.1608e+002	1.9095e+013	4.6410e+002	1.7172e+007
Sr-90	6.9467e+001	2.5703e+012	6.2470e+001	2.3114e+006
Sr-91	6.3084e-001	2.3341e+010	5.6730e-001	2.0990e+004
Sr-92	1.6002e-008	5.9206e+002	1.4390e-008	5.3243e-004
Tc-99m	5.0084e+001	1.8531e+012	4.5040e+001	1.6665e+006
Te-127	7.8674e+001	2.9109e+012	7.0750e+001	2.6178e+006
Te-127m	2.0928e+001	7.7433e+011	1.8820e+001	6.9634e+005
Te-129	7.0656e+001	2.6143e+012	6.3540e+001	2.3510e+006
Te-129m	8.1710e+001	3.0233e+012	7.3480e+001	2.7188e+006
Te-131m	3.1003e+001	1.1471e+012	2.7880e+001	1.0316e+006
Te-132	8.7192e+002	3.2261e+013	7.8410e+002	2.9012e+007
Y-90	4.5069e+001	1.6676e+012	4.0530e+001	1.4996e+006
Y-91	8.5090e+000	3.1483e+011	7.6520e+000	2.8312e+005
Y-92	1.6269e-005	6.0194e+005	1.4630e-005	5.4131e-001
Y-93	7.7985e-003	2.8854e+008	7.0130e-003	2.5948e+002
Zr-95	9.7456e+000	3.6059e+011	8.7640e+000	3.2427e+005
Zr-97	1.9638e-001	7.2660e+009	1.7660e-001	6.5342e+003

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	3.076e+08	0.000e+00	4.998e-28	0.000e+00	4.287e-29
0.02	5.305e+11	0.000e+00	1.356e-24	0.000e+00	4.698e-26
0.03	4.354e+13	1.177e-131	2.462e-22	1.166e-133	2.440e-24
0.04	1.664e+12	2.414e-64	2.494e-23	1.068e-66	1.103e-25
0.05	4.248e+12	3.034e-39	2.082e-22	8.083e-42	5.546e-25

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.899e+12	1.585e-28	6.680e-22	3.148e-31	1.327e-24
0.08	6.834e+12	9.222e-19	8.868e-17	1.459e-21	1.403e-19
0.1	3.797e+12	2.570e-15	5.784e-13	3.932e-18	8.850e-16
0.15	6.552e+12	2.281e-11	1.008e-08	3.757e-14	1.659e-11
0.2	3.201e+13	6.148e-09	3.025e-06	1.085e-11	5.338e-09
0.3	3.307e+13	7.020e-07	2.378e-04	1.332e-09	4.511e-07
0.4	1.854e+14	8.196e-05	1.736e-02	1.597e-07	3.382e-05
0.5	5.972e+13	2.474e-04	3.487e-02	4.856e-07	6.845e-05
0.6	1.722e+14	4.115e-03	4.098e-01	8.032e-06	7.998e-04
0.8	1.218e+14	4.074e-02	2.347e+00	7.750e-05	4.465e-03
1.0	3.145e+13	7.308e-02	2.782e+00	1.347e-04	5.129e-03
1.5	3.443e+13	2.033e+00	3.889e+01	3.420e-03	6.543e-02
2.0	1.553e+12	6.799e-01	8.636e+00	1.051e-03	1.336e-02
3.0	9.715e+11	4.640e+00	3.574e+01	6.296e-03	4.849e-02
TOTALS:	7.416e+14	7.471e+00	8.886e+01	1.099e-02	1.378e-01

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Pennsylvania Power & Light Co.

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DOS File: RHR240.MS5
Run Date: September 2, 2005
Run Time: 2:52:29 PM
Duration: 00:00:32

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

Case Title: Control Room
Description: 12 inch RHR - Time = 240 hour
Geometry: 7 - Cylinder Volume - Side Shields

Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	1.2243e-003	4.5300e+007	1.1010e-003	4.0737e+001
Ba-137m	9.0973e+002	3.3660e+013	8.1810e+002	3.0270e+007
Ba-139				
Ba-140	5.0629e+002	1.8733e+013	4.5530e+002	1.6846e+007
Ce-141	1.6213e+001	5.9988e+011	1.4580e+001	5.3946e+005
Ce-143	1.2010e-001	4.4436e+009	1.0800e-001	3.9960e+003
Ce-144	1.6424e+001	6.0770e+011	1.4770e+001	5.4649e+005
Cm-242	2.8378e-001	1.0500e+010	2.5520e-001	9.4424e+003
Cm-244	1.7336e-002	6.4143e+008	1.5590e-002	5.7683e+002
Co-58	2.9902e-001	1.1064e+010	2.6890e-001	9.9493e+003
Co-60	1.7681e-001	6.5419e+009	1.5900e-001	5.8830e+003
Cs-134	1.2666e+003	4.6863e+013	1.1390e+003	4.2143e+007
Cs-136	2.4053e+002	8.8994e+012	2.1630e+002	8.0031e+006
Cs-137	9.6166e+002	3.5581e+013	8.6480e+002	3.1998e+007
I-131	3.0280e+003	1.1204e+014	2.7230e+003	1.0075e+008
I-132	2.4375e+002	9.0188e+012	2.1920e+002	8.1104e+006
I-133	4.9862e+000	1.8449e+011	4.4840e+000	1.6591e+005
I-134				
I-135	1.6535e-007	6.1181e+003	1.4870e-007	5.5019e-003
La-140	5.7157e+002	2.1148e+013	5.1400e+002	1.9018e+007
La-141				
La-142				
Mo-99	9.0383e+000	3.3442e+011	8.1280e+000	3.0074e+005
Nb-95	8.4468e+000	3.1253e+011	7.5960e+000	2.8105e+005

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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	1.7180e+000	6.3567e+010	1.5450e+000	5.7165e+004
Np-239	1.2432e+001	4.5999e+011	1.1180e+001	4.1366e+005
Pr-143	5.5233e+000	2.0436e+011	4.9670e+000	1.8378e+005
Pr-144	1.6189e+001	5.9901e+011	1.4559e+001	5.3868e+005
Pu-238	5.0752e-002	1.8778e+009	4.5640e-002	1.6887e+003
Pu-239	5.4444e-003	2.0144e+008	4.8960e-003	1.8115e+002
Pu-240	8.6603e-003	3.2043e+008	7.7880e-003	2.8816e+002
Pu-241	2.1328e+000	7.8914e+010	1.9180e+000	7.0966e+004
Rb-86	8.3233e+000	3.0796e+011	7.4850e+000	2.7695e+005
Rh-103m	8.0086e+001	2.9632e+012	7.2020e+001	2.6647e+006
Rh-105	6.4485e-001	2.3859e+010	5.7990e-001	2.1456e+004
Rh-106	3.7430e+001	1.3849e+012	3.3660e+001	1.2454e+006
Ru-103	8.0298e+001	2.9710e+012	7.2210e+001	2.6718e+006
Ru-105	3.5384e-015	1.3092e-004	3.1820e-015	1.1773e-010
Ru-106	3.7430e+001	1.3849e+012	3.3660e+001	1.2454e+006
Sb-127	1.7269e+001	6.3897e+011	1.5530e+001	5.7461e+005
Sb-129	7.2958e-015	2.6995e-004	6.5610e-015	2.4276e-010
Sr-89	3.9899e+002	1.4762e+013	3.5880e+002	1.3276e+007
Sr-90	5.8291e+001	2.1568e+012	5.2420e+001	1.9395e+006
Sr-91	1.4489e-005	5.3611e+005	1.3030e-005	4.8211e-001
Sr-92				
Tc-99m	9.2663e+000	3.4285e+011	8.3330e+000	3.0832e+005
Te-127	3.3816e+001	1.2512e+012	3.0410e+001	1.1252e+006
Te-127m	1.7125e+001	6.3362e+011	1.5400e+001	5.6980e+005
Te-129	5.2409e+001	1.9391e+012	4.7130e+001	1.7438e+006
Te-129m	6.0604e+001	2.2423e+012	5.4500e+001	2.0165e+006
Te-131m	9.3408e-001	3.4561e+010	8.4000e-001	3.1080e+004
Te-132	2.0427e+002	7.5582e+012	1.8370e+002	6.7969e+006
Y-90	5.4254e+001	2.0074e+012	4.8790e+001	1.8052e+006
Y-91	6.6542e+000	2.4621e+011	5.9840e+000	2.2141e+005
Y-92				
Y-93	3.3427e-007	1.2368e+004	3.0060e-007	1.1122e-002
Zr-95	7.6661e+000	2.8365e+011	6.8940e+000	2.5508e+005
Zr-97	4.4880e-004	1.6606e+007	4.0360e-004	1.4933e+001

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	2.557e+08	0.000e+00	4.155e-28	0.000e+00	3.563e-29
0.02	2.895e+11	0.000e+00	7.402e-25	0.000e+00	2.564e-26
0.03	1.814e+13	4.902e-132	1.026e-22	4.858e-134	1.017e-24
0.04	1.161e+12	1.684e-64	1.740e-23	7.449e-67	7.696e-26
0.05	1.003e+12	7.161e-40	4.914e-23	1.908e-42	1.309e-25

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Run Time: 2:52:29 PM
Duration: 00:00:32

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	1.127e+12	9.408e-29	3.965e-22	1.869e-31	7.875e-25
0.08	3.504e+12	4.728e-19	4.547e-17	7.483e-22	7.196e-20
0.1	7.324e+11	4.958e-16	1.116e-13	7.585e-19	1.707e-16
0.15	3.276e+12	1.141e-11	5.038e-09	1.878e-14	8.296e-12
0.2	8.408e+12	1.615e-09	7.946e-07	2.850e-12	1.402e-09
0.3	1.854e+13	3.936e-07	1.333e-04	7.466e-10	2.529e-07
0.4	9.284e+13	4.105e-05	8.695e-03	7.998e-08	1.694e-05
0.5	2.121e+13	8.786e-05	1.238e-02	1.725e-07	2.431e-05
0.6	1.078e+14	2.576e-03	2.565e-01	5.028e-06	5.006e-04
0.8	7.153e+13	2.393e-02	1.379e+00	4.552e-05	2.623e-03
1.0	1.520e+13	3.532e-02	1.345e+00	6.511e-05	2.479e-03
1.5	2.304e+13	1.360e+00	2.602e+01	2.288e-03	4.378e-02
2.0	4.824e+11	2.111e-01	2.682e+00	3.265e-04	4.147e-03
3.0	7.530e+11	3.597e+00	2.771e+01	4.880e-03	3.759e-02
TOTALS:	3.890e+14	5.230e+00	5.941e+01	7.611e-03	9.116e-02

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Pennsylvania Power & Light Co.

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DOS File: RHR480.MS5
Run Date: September 2, 2005
Run Time: 2:54:09 PM
Duration: 00:00:32

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

Case Title: Control Room
Description: 12 inch RHR - Time = 480 hour
Geometry: 7 - Cylinder Volume - Side Shields

Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	9.8423e-004	3.6417e+007	8.8510e-004	3.2749e+001
Ba-137m	6.7904e+002	2.5124e+013	6.1064e+002	2.2594e+007
Ba-139				
Ba-140	2.1951e+002	8.1218e+012	1.9740e+002	7.3038e+006
Ce-141	9.7834e+000	3.6198e+011	8.7980e+000	3.2553e+005
Ce-143	5.8035e-004	2.1473e+007	5.2190e-004	1.9310e+001
Ce-144	1.1965e+001	4.4271e+011	1.0760e+001	3.9812e+005
Cm-242	2.0316e-001	7.5170e+009	1.8270e-001	6.7599e+003
Cm-244	1.2933e-002	4.7850e+008	1.1630e-002	4.3031e+002
Co-58	2.0250e-001	7.4923e+009	1.8210e-001	6.7377e+003
Co-60	1.3166e-001	4.8714e+009	1.1840e-001	4.3808e+003
Cs-134	9.3753e+002	3.4689e+013	8.4310e+002	3.1195e+007
Cs-136	1.0583e+002	3.9157e+012	9.5170e+001	3.5213e+006
Cs-137	7.1780e+002	2.6558e+013	6.4550e+002	2.3883e+007
I-131	9.5510e+002	3.5339e+013	8.5890e+002	3.1779e+007
I-132	2.1695e+001	8.0272e+011	1.9510e+001	7.2187e+005
I-133	1.2521e-003	4.6328e+007	1.1260e-003	4.1662e+001
I-134				
I-135				
La-140	2.5476e+002	9.4261e+012	2.2910e+002	8.4767e+006
La-141				
La-142				
Mo-99	5.4299e-001	2.0091e+010	4.8830e-001	1.8067e+004
Nb-95	6.1405e+000	2.2720e+011	5.5220e+000	2.0431e+005

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Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	6.8277e-001	2.5262e+010	6.1400e-001	2.2718e+004
Np-239	4.8950e-001	1.8112e+010	4.4020e-001	1.6287e+004
Pr-143	2.4809e+000	9.1792e+010	2.2310e+000	8.2547e+004
Pr-144	1.1794e+001	4.3638e+011	1.0606e+001	3.9243e+005
Pu-238	3.7953e-002	1.4042e+009	3.4130e-002	1.2628e+003
Pu-239	4.0688e-003	1.5055e+008	3.6590e-003	1.3538e+002
Pu-240	6.4685e-003	2.3933e+008	5.8170e-003	2.1523e+002
Pu-241	1.5913e+000	5.8877e+010	1.4310e+000	5.2947e+004
Rb-86	4.2879e+000	1.5865e+011	3.8560e+000	1.4267e+005
Rh-103m	5.0141e+001	1.8552e+012	4.5091e+001	1.6684e+006
Rh-105	4.3613e-003	1.6137e+008	3.9220e-003	1.4511e+002
Rh-106	2.7433e+001	1.0150e+012	2.4670e+001	9.1279e+005
Ru-103	5.0274e+001	1.8601e+012	4.5210e+001	1.6728e+006
Ru-105				
Ru-106	2.7433e+001	1.0150e+012	2.4670e+001	9.1279e+005
Sb-127	2.1317e+000	7.8873e+010	1.9170e+000	7.0929e+004
Sb-129				
Sr-89	2.5976e+002	9.6112e+012	2.3360e+002	8.6432e+006
Sr-90	4.3513e+001	1.6100e+012	3.9130e+001	1.4478e+006
Sr-91	2.6866e-013	9.9404e-003	2.4160e-013	8.9392e-009
Sr-92				
Tc-99m	5.5667e-001	2.0597e+010	5.0060e-001	1.8522e+004
Te-127	1.4334e+001	5.3035e+011	1.2890e+001	4.7693e+005
Te-127m	1.2065e+001	4.4641e+011	1.0850e+001	4.0145e+005
Te-129	3.1848e+001	1.1784e+012	2.8640e+001	1.0597e+006
Te-129m	3.6829e+001	1.3627e+012	3.3120e+001	1.2254e+006
Te-131m	2.7255e-003	1.0084e+008	2.4510e-003	9.0687e+001
Te-132	1.8181e+001	6.7270e+011	1.6350e+001	6.0495e+005
Y-90	4.3524e+001	1.6104e+012	3.9140e+001	1.4482e+006
Y-91	4.4146e+000	1.6334e+011	3.9700e+000	1.4689e+005
Y-92				
Y-93	1.7547e-014	6.4925e-004	1.5780e-014	5.8386e-010
Zr-95	5.1386e+000	1.9013e+011	4.6210e+000	1.7098e+005
Zr-97	1.7803e-008	6.5872e+002	1.6010e-008	5.9237e-004

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.859e+08	0.000e+00	3.020e-28	0.000e+00	2.591e-29
0.02	1.610e+11	0.000e+00	4.117e-25	0.000e+00	1.426e-26
[illegible]3	6.482e+12	1.751e-132	3.665e-23	1.736e-134	3.632e-25
0.04	7.036e+11	1.021e-64	1.055e-23	4.516e-67	4.665e-26
0.05	9.517e+10	6.797e-41	4.664e-24	1.811e-43	1.243e-26

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	4.916e+11	4.104e-29	1.729e-22	8.151e-32	3.435e-25
0.08	1.179e+12	1.590e-19	1.530e-17	2.517e-22	2.420e-20
0.1	8.753e+10	5.925e-17	1.333e-14	9.064e-20	2.040e-17
0.15	1.370e+12	4.770e-12	2.107e-09	7.855e-15	3.469e-12
0.2	1.287e+12	2.473e-10	1.217e-07	4.364e-13	2.147e-10
0.3	7.134e+12	1.514e-07	5.130e-05	2.873e-10	9.732e-08
0.4	2.942e+13	1.301e-05	2.756e-03	2.535e-08	5.369e-06
0.5	9.232e+12	3.825e-05	5.391e-03	7.507e-08	1.058e-05
0.6	6.871e+13	1.642e-03	1.635e-01	3.204e-06	3.191e-04
0.8	4.159e+13	1.392e-02	8.017e-01	2.647e-05	1.525e-03
1.0	6.175e+12	1.435e-02	5.462e-01	2.645e-05	1.007e-03
1.5	1.019e+13	6.018e-01	1.151e+01	1.012e-03	1.937e-02
2.0	1.100e+11	4.813e-02	6.114e-01	7.442e-05	9.454e-04
3.0	3.356e+11	1.603e+00	1.235e+01	2.175e-03	1.675e-02
TOTALS:	1.848e+14	2.283e+00	2.599e+01	3.318e-03	3.994e-02

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

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

Case Title: Control Room
Description: 12 inch RHR - Time = 720 hour
Geometry: 7 - Cylinder Volume - Side Shields

Source Dimensions

Height	1.5e+3 cm	50 ft
Radius	15.24 cm	6.0 in

Dose Points

	X	Y	Z
# 1	2636.52 cm	762 cm	0 cm
	86 ft 6.0 in	25 ft	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.11e+06 cm³	Water	1
Transition		Air	0.00122
Shield 2	91.44 cm	Concrete	2.35
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/cm³	Bq/cm³
Am-241	7.8730e-004	2.9130e+007	7.0800e-004	2.6196e+001
Ba-137m	5.0694e+002	1.8757e+013	4.5588e+002	1.6867e+007
Ba-139				
Ba-140	9.5154e+001	3.5207e+012	8.5570e+001	3.1661e+006
Ce-141	5.9047e+000	2.1847e+011	5.3100e+000	1.9647e+005
Ce-143	2.8034e-006	1.0372e+005	2.5210e-006	9.3277e-002
Ce-144	8.7270e+000	3.2290e+011	7.8480e+000	2.9038e+005
Cm-242	1.4545e-001	5.3816e+009	1.3080e-001	4.8396e+003
Cm-244	9.6544e-003	3.5721e+008	8.6820e-003	3.2123e+002
Co-58	1.3722e-001	5.0772e+009	1.2340e-001	4.5658e+003
Co-60	9.7956e-002	3.6244e+009	8.8090e-002	3.2593e+003
Cs-134	6.9400e+002	2.5678e+013	6.2410e+002	2.3092e+007
Cs-136	4.6571e+001	1.7231e+012	4.1880e+001	1.5496e+006
Cs-137	5.3587e+002	1.9827e+013	4.8190e+002	1.7830e+007
I-131	3.0124e+002	1.1146e+013	2.7090e+002	1.0023e+007
I-132	1.9315e+000	7.1467e+010	1.7370e+000	6.4269e+004
I-133	3.1447e-007	1.1636e+004	2.8280e-007	1.0464e-002
I-134				
I-135				
La-140	1.1052e+002	4.0893e+012	9.9390e+001	3.6774e+006
La-141				
La-142				
Mo-99	3.2615e-002	1.2068e+009	2.9330e-002	1.0852e+003
Nb-95	4.4091e+000	1.6314e+011	3.9650e+000	1.4671e+005

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TFM 4/24/07

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Nd-147	2.7133e-001	1.0039e+010	2.4400e-001	9.0280e+003
Np-239	1.9271e-002	7.1303e+008	1.7330e-002	6.4121e+002
Pr-143	1.1114e+000	4.1123e+010	9.9950e-001	3.6981e+004
Pr-144	8.6022e+000	3.1828e+011	7.7358e+000	2.8622e+005
Pu-238	2.8378e-002	1.0500e+009	2.5520e-002	9.4424e+002
Pu-239	3.0391e-003	1.1245e+008	2.7330e-003	1.0112e+002
Pu-240	4.8316e-003	1.7877e+008	4.3450e-003	1.6076e+002
Pu-241	1.1865e+000	4.3901e+010	1.0670e+000	3.9479e+004
Rb-86	2.2095e+000	8.1753e+010	1.9870e+000	7.3519e+004
Rh-103m	3.1398e+001	1.1617e+012	2.8236e+001	1.0447e+006
Rh-105	2.9490e-005	1.0911e+006	2.6520e-005	9.8124e-001
Rh-106	2.0116e+001	7.4429e+011	1.8090e+001	6.6933e+005
Ru-103	3.1481e+001	1.1648e+012	2.8310e+001	1.0475e+006
Ru-105				
Ru-106	2.0116e+001	7.4429e+011	1.8090e+001	6.6933e+005
Sb-127	2.6321e-001	9.7388e+009	2.3670e-001	8.7579e+003
Sb-129				
Sr-89	1.6914e+002	6.2580e+012	1.5210e+002	5.6277e+006
Sr-90	3.2482e+001	1.2018e+012	2.9210e+001	1.0808e+006
Sr-91				
Sr-92				
Tc-99m	3.3438e-002	1.2372e+009	3.0070e-002	1.1126e+003
Te-127	8.8893e+000	3.2891e+011	7.9940e+000	2.9578e+005
Te-127m	8.4668e+000	3.1327e+011	7.6140e+000	2.8172e+005
Te-129	1.9360e+001	7.1632e+011	1.7410e+001	6.4417e+005
Te-129m	2.2385e+001	8.2823e+011	2.0130e+001	7.4481e+005
Te-131m	7.9541e-006	2.9430e+005	7.1530e-006	2.6466e-001
Te-132	1.6180e+000	5.9865e+010	1.4550e+000	5.3835e+004
Y-90	3.2648e+001	1.2080e+012	2.9360e+001	1.0863e+006
Y-91	2.9290e+000	1.0837e+011	2.6340e+000	9.7458e+004
Y-92				
Y-93				
Zr-95	3.4439e+000	1.2742e+011	3.0970e+000	1.1459e+005
Zr-97	7.0590e-013	2.6118e-002	6.3480e-013	2.3488e-008

Buildup
The material reference is : Shield 2

Integration Parameters

Radial	25
Circumferential	25
Y Direction (axial)	25

Results

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.015	1.335e+08	0.000e+00	2.169e-28	0.000e+00	1.860e-29
0.02	9.962e+10	0.000e+00	2.547e-25	0.000e+00	8.823e-27
0.03	3.137e+12	8.476e-133	1.774e-23	8.400e-135	1.758e-25
0.04	4.526e+11	6.567e-65	6.785e-24	2.905e-67	3.001e-26
0.05	1.220e+10	8.713e-42	5.979e-25	2.321e-44	1.593e-27

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Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.06	2.165e+11	1.807e-29	7.617e-23	3.590e-32	1.513e-25
0.08	4.055e+11	5.472e-20	5.262e-18	8.659e-23	8.327e-21
0.1	2.422e+10	1.639e-17	3.689e-15	2.508e-20	5.644e-18
0.15	6.333e+11	2.205e-12	9.740e-10	3.632e-15	1.604e-12
0.2	3.452e+11	6.631e-11	3.262e-08	1.170e-13	5.758e-11
0.3	2.832e+12	6.012e-08	2.037e-05	1.140e-10	3.864e-08
0.4	9.361e+12	4.139e-06	8.767e-04	8.065e-09	1.708e-06
0.5	4.471e+12	1.852e-05	2.611e-03	3.636e-08	5.125e-06
0.6	4.917e+13	1.175e-03	1.170e-01	2.293e-06	2.283e-04
0.8	2.784e+13	9.317e-03	5.368e-01	1.772e-05	1.021e-03
1.0	2.930e+12	6.809e-03	2.592e-01	1.255e-05	4.778e-04
1.5	4.707e+12	2.779e-01	5.316e+00	4.675e-04	8.944e-03
2.0	3.961e+10	1.733e-02	2.202e-01	2.680e-05	3.405e-04
3.0	1.456e+11	6.955e-01	5.358e+00	9.436e-04	7.269e-03
TOTALS:	1.068e+14	1.008e+00	1.181e+01	1.471e-03	1.829e-02