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Consequences of a Radioactive Surface Pool Resulting from Waste Transfer Operations between Tanks 241-C-106 and 241-AY-102

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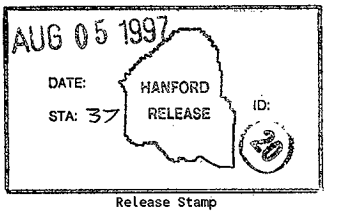
Abstract: This document contains supporting calculations for quantifying the dose consequences from a pool formed from an underground leak or a leak from an above grade structure for the Waste Retrieval Sluicing System (Project W-320), i.e., sluicing the contents of Tank 241-C-106 (high heat, SST) into Tank 241-AY-102 (aging waste, DST).



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Consequences of a Radioactive Surface Pool Resulting from Waste Transfer Operations between Tanks 241-C-106 and 241-AY-102

Safety Analysis and Risk Assessment

Terry Simpson

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Consequences of a Radioactive Surface Pool Resulting from Waste Transfer Operations between Tanks 241-C-106 and 241-AY-102

1.0 PURPOSE

Under waste retrieval Project W-320, the U.S. Department of Energy is taking action to eliminate safety concerns with regard to storage of high-heat waste in tank 241-C-106 and to demonstrate a tank waste retrieval technology. Under Project W-320, the high heat content solids contained in tank 241-C-106 are to be removed by sluicing and transferred to double shell tank 241-AY-102, an Aging-Waste Facility (AWF) tank, through a slurry line. The supernate in tank 241-AY-102 is to be used for the sluicing that mobilizes the waste in tank 241-C-106.

Two transfer lines would connect the two tanks, one to carry the sluiced slurry to tank 241-AY-102, and the other to return the supernatant liquid to tank 241-C-106. Other equipment necessary for the operations include pumps in each tank, a sluicer to direct the supernatant stream in tank 241-C-106, a slurry distributor in tank 241-AY-102, ventilation systems for both tanks, instrumentation, and control devices.

Leaks from transfer lines are considered to be one of the more likely accidents within the Tank Waste Remediation System. Seismic-induced piping breaks, as well as other subsurface and surface leaks can result in the formation of large surface pools of radioactive waste. Detailed calculations for the final safety analysis for the tank remediation system are documented in WHC-SD-WM-CN-049, *Calculation Notes For Surface Leak Resulting In Pool, TWRS FSAR Accident Analysis*, and in WHC-SD-WM-CN-057, *Calculation Notes For Subsurface Leak Resulting In Pool, TWRS FSAR Accident Analysis*.

Accidents that form surface pools of radioactive and chemically toxic waste are of safety concern because a fraction of the waste can be resuspended (entrained) in wind blowing over the surface of the pool, or over the surface of contaminated soil after the pool soaks into the soil. Resuspended waste can lead to significant radiological and toxicological inhalation doses to onsite and offsite receptors. In addition, radioactive waste surface pools and radioactive contaminated soil can produce significant shine dose (direct gamma radiation dose) and skyshine dose (dose due to scattering of gamma rays off the atmosphere) to onsite receptors.

A breach of the slurry transfer line was selected as the bounding, representative accident for detailed analysis. Because an unconstrained pipe break permits waste to flow at 650 gpm, the scenario produces the largest surface pool in 12 hours. Local flooding is assumed to uncover the line during transfer operations, the line is breached, and the waste spills directly on the ground.

Alternatively, an overflow of the pit due to a routing of slurry through an open nozzle could occur if a blank flange were grossly misaligned or entirely left off of a flushing connection (a combination of maintenance error and communications error between different groups using the pit). When sluicing flow was initiated there would be a spray of slurry into the pit. Once the pit were filled, the waste would float the cover plug from the cover block, and the waste would overflow from the pit onto the ground. However, in this case the flow would probably be constrained to less than 450 gpm and a smaller surface pool would form within the 12 hours.

The unmitigated scenario assumes that the spilled slurry's 67/33 (liquid to solid ratio) content is conservatively all aging-waste facility (AWF) liquids and solids, the leak is detected at 7 hours, any onsite personnel are evacuated immediately, and the leak cannot be stopped until the pumping is terminated after 12 hours.

The mitigated accident scenario assumes that the spilled slurry's 67/33 content reflects the mixed average of tank 241-AY-102 (AWF liquids and solids) and tank 241-C-106 (single-shell tank [SST] liquids and solids), the operator detects the leak within 43 minutes, the pump is turned off, and any onsite personnel are evacuated immediately.

2.0 SUMMARY

Table 1 summarizes the radiological and toxicological consequences. Table 2 shows the time-development of the unmitigated radiological dose accumulated by the onsite person at 100 meters from the leak site. (Note that this position is in contradistinction with previous analyses, WHC-SD-WM-CN-049 and WHC-SD-WM-CN-057, which placed the onsite person at *100 meters from the edge of the liquid pool*). Table 3 shows the time-development of the mitigated radiological dose accumulated by the onsite person at 100 meters from the leak site. Figure 1 illustrates the contributing photon radiation dose rates from an unmitigated growing liquid pool; it can be seen that the contribution from skyshine is always greater than the contribution from direct shine for times less than about 310 minutes. Figure 2 illustrates the relative radiological contributions from photon radiation and inhalation for the unmitigated situation; it can be seen that the dose from photon radiation (skyshine and direct shine) is always much greater than the dose accrued from inhalation whenever a large, nearby radioactive pool is present. Figure 3 illustrates the time-dependence of accumulating radiological dose for the 43-minute span of the mitigated accident situation.

3.0 MAJOR ASSUMPTIONS

3.1. The unit liter dose for the unmitigated waste is assumed to be 5.6×10^5 Sv/L, which corresponds to a slurry whose composition is 67% AWF liquids and 33% AWF solids. This is an enabling assumption.

Sensitivity. Radiological inhalation consequences are directly proportional to the unit liter dose.

3.2. The unit liter dose for the mitigated scenario is assumed to be 1.2×10^5 Sv/L. This is an enabling assumption. The mitigated slurry's composition is represented by the asymptotic mix of liquids and solids found at the start of sluicing operations in tanks 241-C-106 and 241-AY-102. As in the unmitigated situation, the slurry is still taken to be 67% liquids and 33% solids, but the mitigated liquids are 10% SST(l) + 90% AWF(l) and the mitigated solids are 90% SST(s) + 10% AWF(s). The mitigated scenario presumes that reasonable care has been taken in operating the sluicing distributor such that the AWF sludge and its more deleterious solids are not preferentially stirred up into the slurry content of the transfer line.

Sensitivity. Radiological inhalation consequences are directly proportional to the unit liter dose.

3.3. In the unmitigated scenario, the transfer pump is not shut off for 12 hours.

Sensitivity. The volume of spilled waste is directly proportional to the time the transfer pump is operating after the leak is started.

3.4. The leak rate out of the open nozzle is 650 gpm.

Sensitivity. The offsite radiological consequences are directly proportional to the leak flow rate, and to the volume of waste that is spilled onto the ground. The onsite inhalation radiological dose is directly proportional to the surface area of the liquid pool of spilled waste. Because we used a "spreading factor", the pool area is a linear function of the flow rate out of the open nozzle.

3.5. The airborne respirable released fraction from the contaminated soil is 8.4×10^{-5}.

Sensitivity. The offsite radiological consequences are directly proportional to the assumed airborne respirable released fraction. This specific value is taken from a 24-hour measured value of 1×10^{-4} for the airborne fraction times a respirable fraction 0.84, shown in DOE-HDBK-3010-94. This appears to be reasonable, compared to other 24-hour data. There is a higher airborne fraction numerical value shown for a 6-hour measurement, which seemed to be excessive; if one were to extrapolate that particular value to 24 hours, the effective release fraction would have been 20 times what was used.

3.6. The airborne respirable released flux from the liquid pool is 2×10^{-10} kg/m^2-s.

Sensitivity. The onsite radiological inhalation dose is directly proportional to the resuspension flux from the liquid pool.

3.7. There is no splatter or splash while the liquid pool is forming from the leaking waste.

Sensitivity. Splatter and splash resuspension rates are much greater than resuspension flux rates from liquid pool surfaces, and the consequences from splatter/splash could dominate onsite radiological consequences if it were present, such as from an open filling pit (cover blocks off).

4.0 DETAILED CALCULATIONS OF MATERIAL RELEASED

4.1 DETAILED CACULATION OF SKYSHINE AND DIRECT SHINE

Attachments 1, 2, 3, and 4 contains the *MICROSKYSHINE*[1] and *MICROSHIELD*[2] cases that were run in order to define the photon radiation doses experienced by an "unaware" person at 100 meters from the center of a growing liquid pool.

4.2 RADIONUCLIDE CONTENT

The radionuclide composition for the unmitigated 67/33 slurry, unit liter dose equal to 5.6×10^5 Sv/L is:

nuclide	Ci/L
^{137m}Ba	2.34
^{60}Co	4.38×10^{-3}
^{154}Eu	9.81×10^{-2}
^{90}Sr, ^{90}Y	26.0 (each)

The radionuclide composition for the mitigated 67/33 slurry unit liter dose equal to 1.2×10^5 Sv/L is:

nuclide	Ci/L
^{137m}Ba	2.24
^{60}Co	3.84×10^{-3}
^{154}Eu	6.06×10^{-2}
^{90}Sr, ^{90}Y	15.54 (each)

4.3 ONSITE PERSON, RADIOLOGICAL CALCULATIONS

The spreadsheets shown in Tables 2 and 3 give the accumulated CEDE doses for an "unaware" person at 100 meters from the center of the growing liquid radioactive pool. For the

[1&2] MICROSKYSHINE and MICROSHIELD are registered trademarks of Grove Engineering, Inc.

accumulated photon dose, the area under the dose rate curve is numerically integrated by taking the area between successive time points as a trapezoid. Therefore, the area between (t_1,y_1) and (t_2,y_2) is approximated by :

$$area = (\frac{1}{2})*([t_1-t_2][y_1+y_2])*(\frac{1}{60})$$

where the division by 60 converts time in minutes to hours.

The inhalation dose from resuspended liquid pool material is directly proportional to the amount released at any given time. See following Section 5.3.1.

5.0 PARAMETERS FOR THE ATMOSPHERIC DISPERSION CALCULATIONS

5.1 METHODOLOGY

5.1.1 Radiological Consequences

The following equation is used to calculate the committed effective dose equivalent (CEDE) for the consequences of releasing the material downwind:

$$(Q)\left(\frac{\chi}{Q}\right)(R)\,(ULD)\,(OF) = CEDE$$

where

Q is the amount of material released (L),
χ/Q is the atmospheric dispersion coefficient (s/m^3), at a given downwind distance,
R is the breathing rate (m^3/s),
ULD is the unit liter dose (Sv/L),
OF is the occupancy factor,
CEDE is the committed effective dose equivalent (Sv).

The following equation is used to calculate the committed effective dose equivalent (CEDE) for the consequences of continuously releasing the material downwind:

$$\left(\frac{dQ}{dt}\right)\left(\frac{\chi}{Q}\right)(ULD)\,(R)\,(OF)\,(t) = CEDE$$

where

dQ/dt is the continuous rate of material released (L/s),
χ/Q = atmospheric dispersion coefficient (s/m^3), at a given downwind distance,
ULD = unit liter dose (Sv/L),
R = breathing rate (m^3/s),
OF = occupancy factor,
t = time duration of the continuous release, and,
CEDE = committed effective dose equivalent (Sv).

5.1.2 Toxicological Consequences

The following equation is used to calculate the sum-of-fractions for the chemically toxic material that is released downwind:

$$\left(\frac{dQ}{dt}\right) SOF = T$$

where

dQ/dt is the rate of material (L/s) being released,
SOF is the sum-of-fraction multiplier, $(L/s)^{-1}$, for specific locations downwind, and,
T is the cumulative sum-of-fractions.

5.2 RATE OF MATERIAL RELEASE, dQ/dt

The following equation is used to calculate the release rate, dQ/dt, in liters per second for the chemically toxic liquid pool material that is released downwind:

$$\frac{dQ}{dt} = \frac{(2 \times 10^{-10})}{1.4} A_{pool}$$

where

2×10^{-10} kg/m^2 is the resuspension rate from a liquid pool,
1.4 kg/L is the density of the 67/33 slurry, and,
A_{pool} is the area of the pool in m^2.

The area of the pool is found using a "spreading factor" as derived in WHC-SD-WM-CN-049:

$$A_{pool} = \frac{(V_{spill})\ (8.7)\ (0.3048)^2}{7.48}$$

where

V_{spill} is the volume of the spill, (650 [gpm])(t [minutes]),
8.7 $[ft]^{-1}$ is the "spreading factor,"
0.3048 is the conversion from feet to meters, and,
7.48 is the conversion from gallons to cubic feet.

The following equation is used to calculate dQ/dt in liters per second for the chemically toxic contaminated soil material that is released downwind:

$$\frac{dQ}{dt} = (650)(3.785)\left(\frac{4 \times 10^{-6}}{3600}\right) t$$

where

the volumetric flow rate is 650 gpm,
3.785 is the number of liters per gallons,
4×10^{-6} $[hr]^{-1}$ is the rate that corresponds to a 24-hour airborne release fraction,
3600 is the number of seconds in a hour, and,
t is the release time in minutes.

We note that for the contaminated soil, the amount lost by resuspension at any given moment is proportional to the amount that is present, so:

$$\frac{dA}{dt} = -aA$$

and the resuspension rate at any particular time is:

$$\frac{dR}{dt} = aA_0 e^{-at}$$

The maximum resuspension rate occurs at time zero.

Because the amount lost to resuspension, R, is given by:

$$R = A_0(1 - e^{-at})$$

then **a** can be calculated from the measured amounts of resuspension, as are given in DOE-HDBK-3010-94. Therefore, if 1×10^{-4} is the fraction lost by 24 hours, then the rate is $\mathbf{a} = 4.2 \times 10^{-6}$ [hr]-1.

5.3 Q, AMOUNT OF MATERIAL RELEASED

5.3.1 Q, Material Released From Growing Unmitigated Liquid Pool

Using the above equation for the rate of material being emitted from a liquid pool as a function of time, the total number of liters of material released, Q, can be found.

$$Q = \int_0^t \frac{dQ}{dt} = (3.01 \times 10^{-7})\, t^2$$

or,

$$Q = \left(\frac{1}{2}\right)\left(\frac{2 \times 10^{-10}}{1.4}\right)(60) A_{pool}\, t$$

or,

$$Q = (4.28 \times 10^{-4}) A_{pool}\, t$$

At 7 hours after the start of the leak, the pool radius will be 96.9 meters, which is nearly to the downwind position of the onsite person. At this time, 273,000 gallons will have been spilled, and the amount of material released through resuspension from the surface of the liquid pool can be calculated to be 5.31×10^{-2} L.

From Table 2, it can be seen that the accumulated inhalation dose, 0.335 Sv, is quite small relative to the accumulated photon dose, 2.62 Sv, from skyshine and direct shine.

5.3.2 Material Released from the Contaminated Soil

The maximum allowable size of the mitigated liquid pool will be determined by the desire to limit the offsite inhalation consequences from the contaminated soil to 1×10^{-3} Sv. The unit liter dose for the mitigated 67/33 slurry is 1.2×10^{5} Sv/L, and the resuspension factor for dry soil is 8.4×10^{-5}. Therefore, the critical amount of dry soil that can be released as respirable aerosols is found from:

$$(Q^{*})(3.3 \times 10^{-4})(2.83 \times 10^{-5})(1.2 \times 10^{5}) = 1 \times 10^{-3}$$

or, $Q^{*} = 0.892$ L. From the resuspension factor, the critical volume of spilled slurry must be 1.06×10^{4} L (28,000 gallons). At 650 gpm, the critical leak duration is calculated to be approximately 43 minutes.

From Table 3, it can be seen that the onsite person would have accumulated 1.29×10^{-2} Sv (1.29 rem): 1.05×10^{-2} Sv from photon radiation and 7.52×10^{-4} Sv from inhalation of aerosols arising from the surface of the liquid pool.

From Figure 3, it can be estimated that in order to keep the onsite exposure to less than 5×10^{-3} Sv, detection and evacuation of the onsite personnel must be accomplished before approximately 27 minutes have elapsed.

5.4 BREATHING RATE, B_R

The breathing rate for exposure durations shorter than 12 hours is taken to be 3.3×10^{-4} m^3/sec. For 24 hours or longer, this is taken to be 2.7×10^{-4} m^3/sec.

5.5 OCCUPANCY FACTOR, OF

With the exception of the onsite position for an annual duration, all OFs are set equal to unity (1.0). For the onsite position for an annual duration OF is equal to 0.286.

5.6 ATMOSPHERIC DISPERSION COEFFICIENT, χ/Q

The following atmospheric dispersion coefficients are used, consistent with the guidance given in *Tank Waste Compositions and Atmospheric Dispersion Coefficients for Use in Safety Analysis Consequence Assessments*, WHC-SD-WM-SARR-016:

Atmospheric Dispersion Coefficients

Position	Duration	χ/Q (s/m³)	Comments
Onsite	continuous, less than an hour	3.41×10^{-2}	Table 4, SARR-016
Onsite	continuous, less than 12 hours	3.41×10^{-2}	For conservatism, the logarithm method has been ignored
Offsite	continuous, less than an hour	2.83×10^{-5}	Table 5, SARR-016
Offsite	24 hours	4.62×10^{-6}	logarithm method
Offsite	annual	1.24×10^{-7}	Table 9, chronic annual release, SARR-016

6.0 REFERENCES

DOE-HDBK-3010-94, 1994, *Airborne Release Fractions/Rates and Respirable Fractions for Nonreactor Nuclear Facilities*, U.S. Department of Energy, Washington, D.C.

WHC-SD-WM-CN-049, 1996, *Calculation Notes For Surface Leak Resulting In Pool, TWRS FSAR Accident Analysis*, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-CN-057, 1996, *Calculation Notes For Subsurface Leak Resulting In Pool, TWRS FSAR Accident Analysis*, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-SARR-016, 1996, *Tank Waste Compositions and Atmospheric Dispersion Coefficients for Use in Safety Analysis Consequence Assessments*, Rev. 2, Westinghouse Hanford Company, Richland, Washington.

Table 1. Radiological and Toxicological Consequences.

Receptor	Time	Radiological		Chemical	
		CEDE (Sv)	Risk Guideline (Sv)	SOF	Risk Guideline
Unmitigated Consequences					
Onsite	7-hour	3.0 (300 rem)	5×10^{-3} (0.5 rem)	0.09	1.0
Offsite	24-hour	0.8 (80 rem)	1.0×10^{-3} (0.1 rem)	0.13	1.0
Mitigated Consequences					
Onsite	43-min	1.3×10^{-2} (1.3 rem)	5×10^{-3} (0.5 rem)	8.3×10^{-3}	1.0
Offsite	43-min	1.0×10^{-3} (0.1 rem)	1.0×10^{-3} (0.1 rem)	$5. \times 10^{-4}$	1.0

Table 2. Unmitigated Release Photon and Inhalation Radiological Dose Accumulations For Onsite Personnel (100 Meters).

Time (minutes)	Shine (mr/h)			Skyshine (mr/h)			Total (mr/h)	Accumulated Shine and Skyshine Dose at 100m (Sv)	Pool Radius (m)	Accumulated Aerosols Released From Liquid Pool (L)	Accumulated Inhalation Dose at 100m (Sv)	Accumulated Onsite Dose (Sv)
	gamma	brems	sum	gamma	brems	sum						
1	13.45	1.877	1.53E+01	45.7	13.86	5.96E+01	7.49E+01	6.24E-06	4.73	3.01E-07	1.90E-06	8.14E-06
2	26.97	3.769	3.07E+01	98.56	29.27	1.28E+02	1.59E+02	2.57E-05	6.69	1.20E-06	7.59E-06	3.33E-05
5	67.99	9.512	7.75E+01	265.9	77.31	3.43E+02	4.21E+02	1.71E-04	10.57	7.53E-06	4.74E-05	2.18E-04
7	95.86	13.42	1.09E+02	380.5	110	4.91E+02	6.00E+02	3.41E-04	12.51	1.47E-05	9.29E-05	4.34E-04
10	138.2	19.37	1.58E+02	554.9	159.6	7.15E+02	8.72E+02	7.09E-04	14.95	3.01E-05	1.90E-04	8.98E-04
12	167	23.42	1.90E+02	672.4	192.9	8.65E+02	1.06E+03	1.03E-03	16.38	4.33E-05	2.73E-04	1.30E-03
15	210.9	29.58	2.40E+02	8.50E+02	2.43E+02	1.09E+03	1.33E+03	1.63E-03	18.31	6.77E-05	4.27E-04	2.05E-03
17	240.8	33.8	2.75E+02	9.69E+02	2.77E+02	1.25E+03	1.52E+03	2.10E-03	19.5	8.70E-05	5.48E-04	2.65E-03
20	286.1	40.2	3.26E+02	1.15E+03	3.28E+02	1.48E+03	1.80E+03	2.93E-03	21.15	1.20E-04	7.59E-04	3.69E-03
25	363.4	51.14	4.15E+02	1.45E+03	4.14E+02	1.86E+03	2.28E+03	4.64E-03	23.64	1.88E-04	1.19E-03	5.82E-03
30	443.5	62.52	5.06E+02	1.75E+03	5.00E+02	2.25E+03	2.76E+03	6.73E-03	25.9	2.71E-04	1.71E-03	8.44E-03
35	526	74.28	6.00E+02	2.06E+03	5.87E+02	2.65E+03	3.25E+03	9.24E-03	27.97	3.69E-04	2.32E-03	1.16E-02
40	611.5	86.49	6.98E+02	2.37E+03	6.75E+02	3.04E+03	3.74E+03	1.22E-02	29.9	4.82E-04	3.03E-03	1.52E-02
43	664.1	94.02	7.58E+02	2.55E+03	728.1	3.28E+03	4.04E+03	1.41E-02	31	5.57E-04	3.51E-03	1.76E-02
60	983.8	140.1	1.12E+03	3.62E+03	1.03E+03	4.65E+03	5.77E+03	2.80E-02	36.62	1.08E-03	6.83E-03	3.48E-02
120	2479	359.8	2.84E+03	7.49E+03	2.16E+03	9.64E+03	1.25E+04	1.19E-01	51.8	4.33E-03	2.73E-02	1.47E-01
180	4.86E+03	719.2	5.58E+03	1.07E+04	3.35E+03	1.40E+04	1.96E+04	2.80E-01	63.44	9.75E-03	6.15E-02	3.41E-01
240	8.96E+03	1.35E+03	1.03E+04	1.55E+04	4.57E+03	2.01E+04	3.04E+04	5.30E-01	73.25	1.73E-02	1.09E-01	6.39E-01
300	1.72E+04	2.67E+03	1.99E+04	1.96E+04	5.80E+03	2.54E+04	4.53E+04	9.08E-01	81.9	2.71E-02	1.71E-01	1.08E+00
360	3.78E+04	6.16E+03	4.40E+04	2.37E+04	7.02E+03	3.07E+04	7.47E+04	1.51E+00	89.71	3.90E-02	2.46E-01	1.75E+00
420	9.58E+04	1.69E+04	1.13E+05	2.75E+04	8.18E+03	3.57E+04	1.48E+05	2.62E+00	96.9	5.31E-02	3.35E-01	2.96E+00

Table 3. Mitigated Release Photon and Inhalation Dose Accumulations For Onsite Personnel (100 Meters).

Time (minutes)	Shine (mr/h)			Skyshine (mr/h)			Total (mr/h)	Accumulated Shine and Skyshine Dose at 100m (Sv)	Pool Radius (m)	Accumulated Aerosols Released From Liquid Pool (L)	Accumulated Inhalation Dose at 100m (Sv)	Accumulated Onsite Dose (Sv)
	gamma	brems	sum	gamma	brems	sum						
1	12.43	1.121	1.36E+01	42.66	8.282	5.09E+01	6.45E+01	5.37E-06	4.73	3.01E-07	4.06E-07	5.78E-06
2	25.05	2.253	2.73E+01	92.02	17.49	1.10E+02	1.37E+02	2.21E-05	6.69	1.20E-06	1.63E-06	2.38E-05
5	63.1	5.685	6.88E+01	248.2	46.21	2.94E+02	3.63E+02	1.47E-04	10.57	7.53E-06	1.02E-05	1.57E-04
7	88.96	8.021	9.70E+01	355.3	65.75	4.21E+02	5.18E+02	2.94E-04	12.51	1.47E-05	1.99E-05	3.14E-04
10	128.3	11.577	1.40E+02	518.1	95.39	6.13E+02	7.53E+02	6.12E-04	14.95	3.01E-05	4.06E-05	6.53E-04
12	155	13.998	1.69E+02	627.8	115.29	7.43E+02	9.12E+02	8.89E-04	16.38	4.33E-05	5.85E-05	9.48E-04
15	195.6	17.680	2.13E+02	7.94E+02	145.44	9.39E+02	1.15E+03	1.41E-03	18.31	6.77E-05	9.15E-05	1.50E-03
17	223.3	20.202	2.44E+02	9.05E+02	165.64	1.07E+03	1.31E+03	1.82E-03	19.5	8.70E-05	1.17E-04	1.93E-03
20	265.3	24.027	2.89E+02	1.07E+03	196.10	1.27E+03	1.56E+03	2.53E-03	21.15	1.20E-04	1.63E-04	2.70E-03
25	336.9	30.566	3.67E+02	1.35E+03	247.27	1.60E+03	1.97E+03	4.00E-03	23.64	1.88E-04	2.54E-04	4.26E-03
30	411.3	37.368	4.49E+02	1.64E+03	298.91	1.94E+03	2.39E+03	5.82E-03	25.9	2.71E-04	3.66E-04	6.18E-03
35	487.8	44.397	5.32E+02	1.92E+03	350.97	2.27E+03	2.81E+03	7.98E-03	27.97	3.69E-04	4.98E-04	8.48E-03
40	567	51.694	6.19E+02	2.21E+03	403.46	2.61E+03	3.23E+03	1.05E-02	29.9	4.82E-04	6.50E-04	1.11E-02
43	616.2	56.18	6.72E+02	2.38E+03	435.18	2.82E+03	3.49E+03	1.22E-02	31	5.57E-04	7.52E-04	1.29E-02

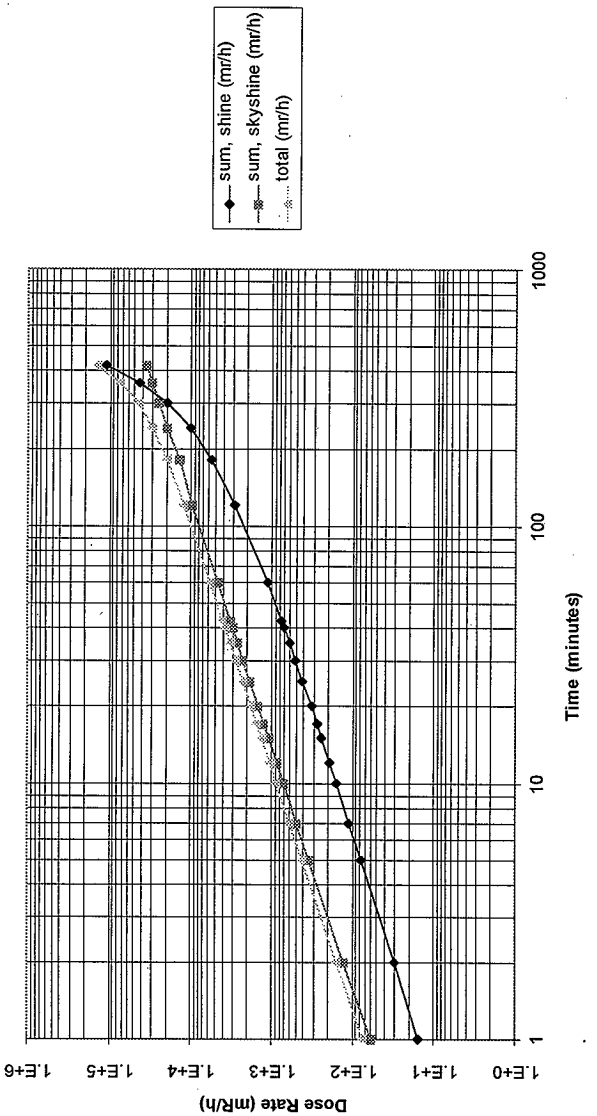

Figure 1. Contributing Photon Dose Rates from an Unmitigated Growing Liquid Pool.

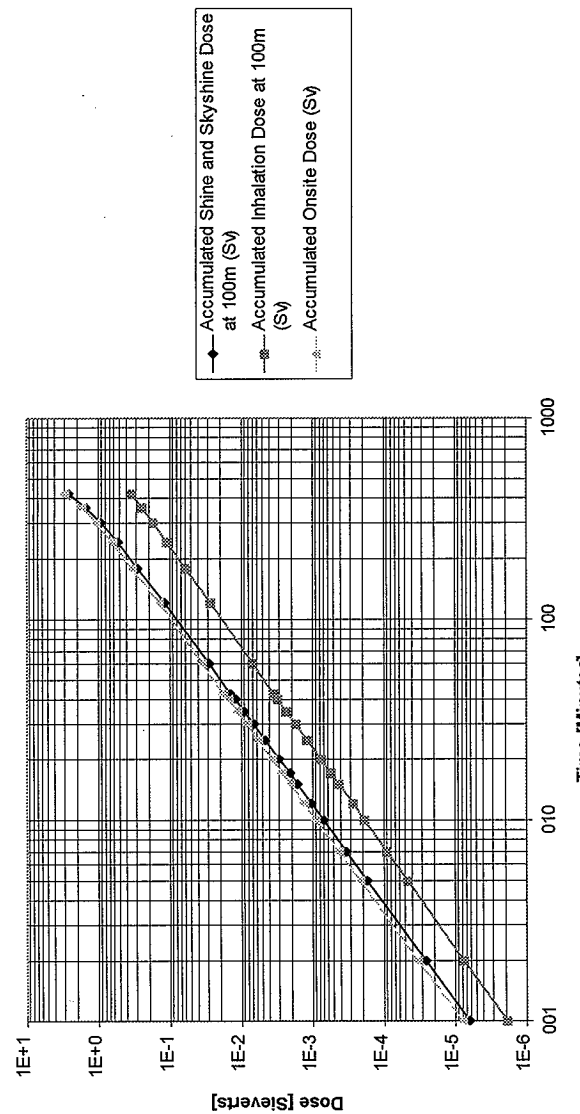

Figure 2. Onsite Doses from the Unmitigated Liquid Pool Formation.

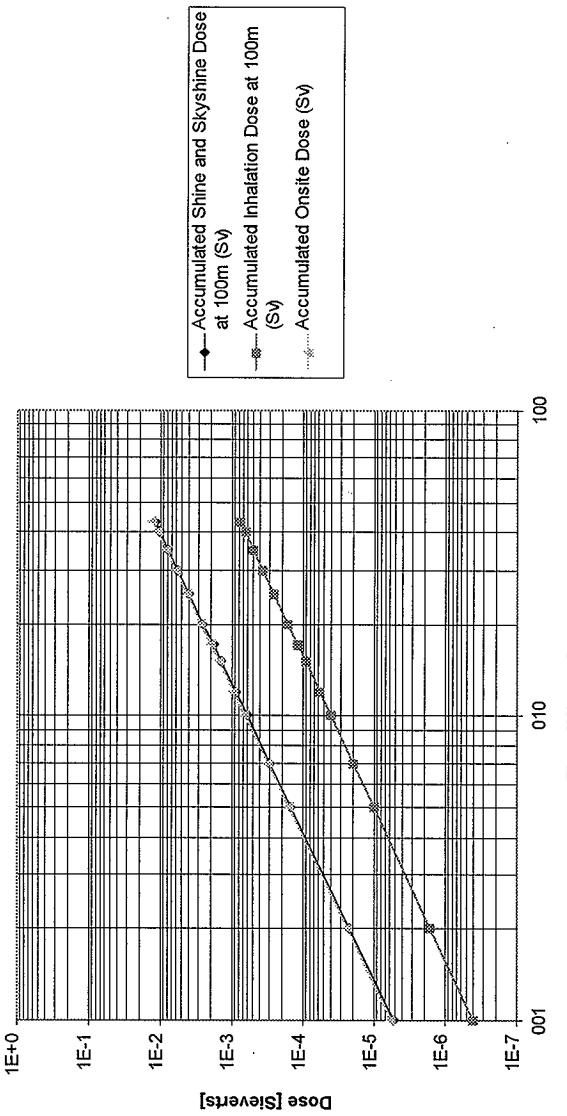

Figure 3. Onsite Doses from the Mitigated Liquid Pool Formation.

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ATTACHMENT 1: UNMITIGATED ACCIDENT MICROSHIELD RUNS

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MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 1M_UNMIT.MS4
Run Date: April 4, 1997
Run Time: 10:10 a.m. Friday
Duration: 0:00:27

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 1min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	473.0	15.0	6.2
Side Clad:	9527.0	312.0	6.8

Source Volume: 2.46003e+6 cm^3 86.8751 cu ft. 150120. cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	5.7619e+003	2.3422e+003	Co-60	1.0770e+001	4.3780e+000
Eu-154	2.4138e+002	9.8121e+001			

Page : 2
DOS File: 1M_UNMIT.MS4
Run Date: April 4, 1997
Run Time: 10:10 a.m. Friday
Title : 1min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	2.141e+013	1.048e+000	1.774e+001	2.872e-003	4.861e-002
0.246	6.099e+011	7.173e-001	7.425e+000	1.320e-003	1.366e-002
0.4426	8.306e+010	2.902e-001	1.766e+000	5.683e-004	3.458e-003
0.5907	5.567e+011	3.328e+000	1.612e+001	6.501e-003	3.149e-002
0.6625	1.943e+014	1.438e+003	6.401e+003	2.788e+000	1.241e+001
0.8723	1.253e+012	1.550e+001	5.715e+001	2.917e-002	1.075e-001
1.0024	2.539e+012	4.072e+001	1.378e+002	7.502e-002	2.539e-001
1.2612	3.704e+012	9.119e+001	2.706e+002	1.603e-001	4.758e-001
1.3325	3.985e+011	1.087e+001	3.132e+001	1.886e-002	5.435e-002
1.5767	3.148e+011	1.173e+001	3.110e+001	1.947e-002	5.161e-002
TOTAL:	2.252e+014	1.614e+003	6.972e+003	3.102e+000	1.345e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 1M_U_B.MS4
Run Date: April 3, 1997
Run Time: 4:44 p.m. Thursday
Duration: 0:01:02

File Ref: _____
Date: ___/___/___
By: _____
Checked: _____

Case Title: 1min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	473.0	15.0	6.2
Side Clad:	9527.0	312.0	6.8

Source Volume: 2.46003e+6 cm^3 86.8751 cu ft. 150120. cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 1M_U_B.MS4
Run Date: April 3, 1997
Run Time: 4:44 p.m. Thursday
Title : 1min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	7.932e+013	3.832e-010	6.665e-010	3.287e-011	5.717e-011
0.025	4.004e+013	1.646e-002	6.442e-002	2.839e-004	1.111e-003
0.035	2.552e+013	2.851e-001	2.351e+000	1.806e-003	1.490e-002
0.045	1.810e+013	6.557e-001	9.404e+000	2.181e-003	3.128e-002
0.055	1.369e+013	9.134e-001	1.821e+001	2.056e-003	4.098e-002
0.065	1.081e+013	1.076e+000	2.519e+001	1.952e-003	4.572e-002
0.075	8.763e+012	1.176e+000	2.904e+001	1.916e-003	4.734e-002
0.085	7.292e+012	1.247e+000	3.063e+001	1.937e-003	4.758e-002
0.095	6.147e+012	1.293e+000	3.059e+001	1.979e-003	4.681e-002
0.15	3.218e+013	1.544e+001	2.579e+002	2.542e-002	4.248e-001
0.25	1.247e+013	1.512e+001	1.540e+002	2.789e-002	2.842e-001
0.35	6.384e+012	1.442e+001	1.073e+002	2.781e-002	2.070e-001
0.475	5.015e+012	1.998e+001	1.148e+002	3.920e-002	2.252e-001
0.65	3.128e+012	2.235e+001	1.008e+002	4.339e-002	1.958e-001
0.825	1.164e+012	1.298e+001	4.961e+001	2.460e-002	9.401e-002
1.0	8.188e+011	1.307e+001	4.430e+001	2.410e-002	8.166e-002
1.225	4.446e+011	1.037e+001	3.126e+001	1.835e-002	5.533e-002
1.475	1.574e+011	5.183e+000	1.419e+001	8.760e-003	2.398e-002
1.7	3.915e+010	1.676e+000	4.293e+000	2.722e-003	6.973e-003
1.9	9.659e+009	5.072e-001	1.238e+000	7.969e-004	1.945e-003
2.1	1.017e+009	6.412e-002	1.501e-001	9.764e-005	2.286e-004
2.3	5.444e+006	4.049e-004	9.137e-004	5.987e-007	1.351e-006
TOTAL:	2.715e+014	1.378e+002	1.025e+003	2.572e-001	1.877e+000

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 2M_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 2:07 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 2 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	669.0	21.0	11.4
Side Clad:	9331.0	306.0	1.6

Source Volume: 4.92119e+6 cm^3 173.79 cu ft. 300309. cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	1.1526e+004	2.3421e+003	Co-60	2.1545e+001	4.3780e+000
Eu-154	4.8287e+002	9.8121e+001			

Page : 2
DOS File: 2M_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 2:07 p.m. Tuesday
Title : 2 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.044	4.863e+013	1.637e+000	2.240e+001	5.733e-003	7.845e-002
0.246	1.220e+012	1.442e+000	1.491e+001	2.653e-003	2.742e-002
0.4426	1.662e+011	5.832e-001	3.545e+000	1.142e-003	6.941e-003
0.5907	1.114e+012	6.685e+000	3.235e+001	1.306e-002	6.320e-002
0.6625	3.887e+014	2.889e+003	1.285e+004	5.601e+000	2.490e+001
0.8723	2.507e+012	3.114e+001	1.147e+002	5.859e-002	2.159e-001
1.0024	5.079e+012	8.177e+001	2.765e+002	1.507e-001	5.096e-001
1.2612	7.409e+012	1.831e+002	5.432e+002	3.219e-001	9.549e-001
1.3325	7.972e+011	2.182e+001	6.287e+001	3.786e-002	1.091e-001
1.5767	6.297e+011	2.355e+001	6.241e+001	3.908e-002	1.036e-001
TOTAL:	4.562e+014	3.241e+003	1.398e+004	6.231e+000	2.697e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 2M_U_B.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 2:16 p.m. Tuesday Checked: _____
Duration: 0:01:06

Case Title: 2 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	669.0	21.0	11.4
Side Clad:	9331.0	306.0	1.6

Source Volume: 4.92119e+6 cm^3 173.79 cu ft. 300309. cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 2M_U_B.MS4
Run Date: July 8, 1997
Run Time: 2:16 p.m. Tuesday
Title : 2 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	1.587e+014	9.218e-010	1.600e-009	7.906e-011	1.373e-010
0.025	8.010e+013	3.368e-002	1.315e-001	5.809e-004	2.268e-003
0.035	5.106e+013	5.765e-001	4.744e+000	3.652e-003	3.005e-002
0.045	3.621e+013	1.323e+000	1.894e+001	4.400e-003	6.298e-002
0.055	2.738e+013	1.842e+000	3.665e+001	4.145e-003	8.248e-002
0.065	2.163e+013	2.167e+000	5.067e+001	3.934e-003	9.198e-002
0.075	1.753e+013	2.369e+000	5.841e+001	3.861e-003	9.519e-002
0.085	1.459e+013	2.511e+000	6.157e+001	3.901e-003	9.564e-002
0.095	1.230e+013	2.603e+000	6.147e+001	3.984e-003	9.407e-002
0.15	6.437e+013	3.106e+001	5.180e+002	5.115e-002	8.531e-001
0.25	2.495e+013	3.039e+001	3.093e+002	5.607e-002	5.706e-001
0.35	1.277e+013	2.898e+001	2.155e+002	5.590e-002	4.156e-001
0.475	1.003e+013	4.014e+001	2.303e+002	7.877e-002	4.520e-001
0.65	6.257e+012	4.490e+001	2.024e+002	8.716e-002	3.930e-001
0.825	2.329e+012	2.607e+001	9.956e+001	4.941e-002	1.887e-001
1.0	1.638e+012	2.625e+001	8.892e+001	4.840e-002	1.639e-001
1.225	8.893e+011	2.082e+001	6.274e+001	3.685e-002	1.110e-001
1.475	3.148e+011	1.041e+001	2.847e+001	1.759e-002	4.812e-002
1.7	7.831e+010	3.365e+000	8.616e+000	5.466e-003	1.399e-002
1.9	1.932e+010	1.018e+000	2.484e+000	1.600e-003	3.903e-003
2.1	2.035e+009	1.287e-001	3.013e-001	1.960e-004	4.587e-004
2.3	1.089e+007	8.128e-004	1.834e-003	1.202e-006	2.712e-006
TOTAL:	5.431e+014	2.770e+002	2.059e+003	5.170e-001	3.769e+000

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 5M_UNMIT.MS4 Date: ___/___/___
Run Date: July 8, 1997 By: _____
Run Time: 1:52 p.m. Tuesday Checked: _____
Duration: 0:00:29

Case Title: 5 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1057.0	34.0	8.1
Side Clad:	8943.0	293.0	4.9

Source Volume: 1.22848e+7 cm^3 433.833 cu ft. 749664. cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	2.8774e+004	2.3422e+003	Co-60	5.3783e+001	4.3780e+000
Eu-154	1.2054e+003	9.8121e+001			

Page : 2
DOS File: 5M_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 1:52 p.m. Tuesday
Title : 5 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.044	1.214e+014	4.193e+000	5.698e+001	1.468e-002	1.996e-001
0.246	3.046e+012	3.656e+000	3.760e+001	6.725e-003	6.917e-002
0.4426	4.148e+011	1.475e+000	8.937e+000	2.889e-003	1.750e-002
0.5907	2.780e+012	1.690e+001	8.156e+001	3.302e-002	1.593e-001
0.6625	9.703e+014	7.303e+003	3.239e+004	1.416e+001	6.278e+001
0.8723	6.258e+012	7.865e+001	2.891e+002	1.480e-001	5.441e-001
1.0024	1.268e+013	2.065e+002	6.970e+002	3.805e-001	1.284e+000
1.2612	1.850e+013	4.622e+002	1.369e+003	8.126e-001	2.407e+000
1.3325	1.990e+012	5.508e+001	1.584e+002	9.556e-002	2.749e-001
1.5767	1.572e+012	5.942e+001	1.573e+002	9.861e-002	2.610e-001
TOTAL:	1.139e+015	8.191e+003	3.524e+004	1.575e+001	6.799e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 5M_U_B.MS4
Run Date: July 8, 1997
Run Time: 2:20 p.m. Tuesday
Duration: 0:01:06

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 5 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1057.0	34.0	8.1
Side Clad:	8943.0	293.0	4.9

Source Volume: 1.22848e+7 cm^3 433.833 cu ft. 749664. cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 5M_U_B.MS4
Run Date: July 8, 1997
Run Time: 2:20 p.m. Tuesday
Title : 5 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	3.961e+014	3.798e-009	6.560e-009	3.258e-010	5.626e-010
0.025	2.000e+014	8.986e-002	3.485e-001	1.550e-003	6.010e-003
0.035	1.275e+014	1.486e+000	1.214e+001	9.416e-003	7.692e-002
0.045	9.040e+013	3.387e+000	4.815e+001	1.127e-002	1.601e-001
0.055	6.836e+013	4.703e+000	9.295e+001	1.058e-002	2.092e-001
0.065	5.398e+013	5.527e+000	1.283e+002	1.003e-002	2.329e-001
0.075	4.376e+013	6.034e+000	1.478e+002	9.834e-003	2.408e-001
0.085	3.642e+013	6.392e+000	1.557e+002	9.930e-003	2.418e-001
0.095	3.070e+013	6.623e+000	1.553e+002	1.014e-002	2.377e-001
0.15	1.607e+014	7.887e+001	1.308e+003	1.299e-001	2.153e+000
0.25	6.229e+013	7.703e+001	7.800e+002	1.421e-001	1.439e+000
0.35	3.188e+013	7.337e+001	5.434e+002	1.415e-001	1.048e+000
0.475	2.504e+013	1.015e+002	5.808e+002	1.992e-001	1.139e+000
0.65	1.562e+013	1.135e+002	5.102e+002	2.203e-001	9.906e-001
0.825	5.814e+012	6.587e+001	2.510e+002	1.248e-001	4.756e-001
1.0	4.089e+012	6.630e+001	2.241e+002	1.222e-001	4.131e-001
1.225	2.220e+012	5.255e+001	1.581e+002	9.301e-002	2.799e-001
1.475	7.858e+011	2.626e+001	7.175e+001	4.438e-002	1.213e-001
1.7	1.955e+011	8.489e+000	2.171e+001	1.379e-002	3.526e-002
1.9	4.823e+010	2.569e+000	6.260e+000	4.036e-003	9.835e-003
2.1	5.079e+009	3.247e-001	7.591e-001	4.944e-004	1.156e-003
2.3	2.718e+007	2.050e-003	4.621e-003	3.031e-006	6.833e-006
TOTAL:	1.356e+015	7.009e+002	5.196e+003	1.309e+000	9.512e+000

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 7M_UNMIT.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 2:37 p.m. Tuesday Checked: _____
Duration: 0:00:29

Case Title: 7 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1251.0	41.0	.5
Side Clad:	8749.0	287.0	.5

Source Volume: 1.72081e+7 cm^3 607.698 cu ft. 1.0501e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	4.0306e+004	2.3422e+003	Co-60	7.5337e+001	4.3780e+000
Eu-154	1.6885e+003	9.8121e+001			

Page : 2
DOS File: 7M_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 2:37 p.m. Tuesday
Title : 7 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.044	1.699e+013	5.967e-001	8.068e+000	2.089e-003	2.825e-002
0.246	4.266e+012	5.173e+000	5.303e+001	9.516e-003	9.756e-002
0.4426	5.810e+011	2.085e+000	1.260e+001	4.084e-003	2.468e-002
0.5907	3.894e+012	2.388e+001	1.150e+002	4.665e-002	2.247e-001
0.6625	1.359e+015	1.031e+004	4.566e+004	1.999e+001	8.851e+001
0.8723	8.766e+012	1.110e+002	4.076e+002	2.089e-001	7.670e-001
1.0024	1.776e+013	2.915e+002	9.826e+002	5.370e-001	1.811e+000
1.2612	2.591e+013	6.522e+002	1.930e+003	1.147e+000	3.392e+000
1.3325	2.787e+012	7.772e+001	2.233e+002	1.348e-001	3.875e-001
1.5767	2.202e+012	8.383e+001	2.217e+002	1.391e-001	3.679e-001
TOTAL:	1.442e+015	1.156e+004	4.961e+004	2.222e+001	9.561e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 7M_U_B.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 2:23 p.m. Tuesday Checked: _____
Duration: 0:01:06

Case Title: 7 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1251.0	41.0	.5
Side Clad:	8749.0	287.0	.5

Source Volume: 1.72081e+7 cm^3 607.698 cu ft. 1.0501e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 7M_U_B.MS4
Run Date: July 8, 1997
Run Time: 2:23 p.m. Tuesday
Title : 7 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	5.548e+014	7.201e-009	1.240e-008	6.177e-010	1.064e-009
0.025	2.801e+014	1.315e-001	5.078e-001	2.269e-003	8.758e-003
0.035	1.785e+014	2.127e+000	1.729e+001	1.347e-002	1.095e-001
0.045	1.266e+014	4.823e+000	6.821e+001	1.604e-002	2.269e-001
0.055	9.575e+013	6.684e+000	1.314e+002	1.504e-002	2.959e-001
0.065	7.562e+013	7.848e+000	1.813e+002	1.425e-002	3.291e-001
0.075	6.130e+013	8.563e+000	2.087e+002	1.396e-002	3.401e-001
0.085	5.101e+013	9.068e+000	2.198e+002	1.409e-002	3.414e-001
0.095	4.300e+013	9.392e+000	2.192e+002	1.437e-002	3.355e-001
0.15	2.251e+014	1.117e+002	1.845e+003	1.840e-001	3.038e+000
0.25	8.725e+013	1.090e+002	1.100e+003	2.011e-001	2.030e+000
0.35	4.466e+013	1.037e+002	7.663e+002	2.001e-001	1.478e+000
0.475	3.508e+013	1.435e+002	8.189e+002	2.816e-001	1.607e+000
0.65	2.188e+013	1.603e+002	7.194e+002	3.112e-001	1.397e+000
0.825	8.144e+012	9.300e+001	3.538e+002	1.762e-001	6.705e-001
1.0	5.727e+012	9.358e+001	3.159e+002	1.725e-001	5.824e-001
1.225	3.110e+012	7.416e+001	2.229e+002	1.313e-001	3.945e-001
1.475	1.101e+012	3.705e+001	1.011e+002	6.262e-002	1.709e-001
1.7	2.738e+011	1.198e+001	3.060e+001	1.945e-002	4.970e-002
1.9	6.756e+010	3.623e+000	8.822e+000	5.692e-003	1.386e-002
2.1	7.114e+009	4.579e-001	1.070e+000	6.973e-004	1.629e-003
2.3	3.808e+007	2.891e-003	6.512e-003	4.275e-006	9.631e-006
TOTAL:	1.899e+015	9.907e+002	7.330e+003	1.850e+000	1.342e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 10M_UN.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 2:40 p.m. Tuesday Checked: _____
Duration: 0:00:29

Case Title: 10 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1495.0	49.0	.6
Side Clad:	8505.0	279.0	.4

Source Volume: 2.45754e+7 cm^3 867.871 cu ft. 1.49968e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	5.7562e+004	2.3422e+003	Co-60	1.0759e+002	4.3780e+000
Eu-154	2.4114e+003	9.8121e+001			

Page : 2
DOS File: 10M_UN.MS4
Run Date: July 8, 1997
Run Time: 2:40 p.m. Tuesday
Title : 10 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.044	2.432e+014	8.754e+000	1.175e+002	3.065e-002	4.114e-001
0.246	6.093e+012	7.500e+000	7.652e+001	1.380e-002	1.408e-001
0.4426	8.297e+011	3.018e+000	1.818e+001	5.911e-003	3.560e-002
0.5907	5.561e+012	3.453e+001	1.658e+002	6.746e-002	3.240e-001
0.6625	1.941e+015	1.491e+004	6.584e+004	2.891e+001	1.276e+002
0.8723	1.252e+013	1.605e+002	5.878e+002	3.019e-001	1.106e+000
1.0024	2.536e+013	4.210e+002	1.417e+003	7.758e-001	2.610e+000
1.2612	3.700e+013	9.418e+002	2.782e+003	1.656e+000	4.891e+000
1.3325	3.981e+012	1.122e+002	3.220e+002	1.947e-001	5.586e-001
1.5767	3.145e+012	1.210e+002	3.195e+002	2.008e-001	5.303e-001
TOTAL:	2.279e+015	1.672e+004	7.165e+004	3.216e+001	1.382e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 10M_U_B.MS4 Date: ___/___/___
Run Date: July 8, 1997 By: _____
Run Time: 2:27 p.m. Tuesday Checked: _____
Duration: 0:01:06

Case Title: 10 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1495.0	49.0	.6
Side Clad:	8505.0	279.0	.4

Source Volume: 2.45754e+7 cm^3 867.871 cu ft. 1.49968e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 10M_U_B.MS4
Run Date: July 8, 1997
Run Time: 2:27 p.m. Tuesday
Title : 10 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	7.924e+014	1.562e-008	2.678e-008	1.339e-009	2.297e-009
0.025	4.000e+014	2.004e-001	7.687e-001	3.457e-003	1.326e-002
0.035	2.550e+014	3.135e+000	2.530e+001	1.986e-002	1.602e-001
0.045	1.808e+014	7.059e+000	9.907e+001	2.348e-002	3.295e-001
0.055	1.367e+014	9.756e+000	1.904e+002	2.196e-002	4.285e-001
0.065	1.080e+014	1.144e+001	2.623e+002	2.076e-002	4.761e-001
0.075	8.755e+013	1.247e+001	3.017e+002	2.033e-002	4.917e-001
0.085	7.285e+013	1.320e+001	3.175e+002	2.050e-002	4.933e-001
0.095	6.141e+013	1.366e+001	3.167e+002	2.091e-002	4.847e-001
0.15	3.214e+014	1.623e+002	2.663e+003	2.672e-001	4.386e+000
0.25	1.246e+014	1.580e+002	1.587e+003	2.916e-001	2.929e+000
0.35	6.377e+013	1.503e+002	1.105e+003	2.898e-001	2.132e+000
0.475	5.010e+013	2.077e+002	1.181e+003	4.075e-001	2.317e+000
0.65	3.125e+013	2.318e+002	1.037e+003	4.499e-001	2.014e+000
0.825	1.163e+013	1.344e+002	5.102e+002	2.547e-001	9.668e-001
1.0	8.179e+012	1.352e+002	4.555e+002	2.492e-001	8.397e-001
1.225	4.441e+012	1.071e+002	3.213e+002	1.895e-001	5.688e-001
1.475	1.572e+012	5.348e+001	1.458e+002	9.039e-002	2.464e-001
1.7	3.911e+011	1.728e+001	4.411e+001	2.807e-002	7.164e-002
1.9	9.649e+010	5.228e+000	1.272e+001	8.213e-003	1.998e-002
2.1	1.016e+010	6.606e-001	1.542e+000	1.006e-003	2.348e-003
2.3	5.438e+007	4.170e-003	9.385e-003	6.167e-006	1.388e-005
TOTAL:	2.712e+015	1.434e+003	1.058e+004	2.678e+000	1.937e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 12M_UN.MS4
Run Date: July 8, 1997
Run Time: 2:44 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 12 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1638.0	53.0	8.9
Side Clad:	8362.0	274.0	4.1

Source Volume: 2.95016e+7 cm^3 1041.84 cu ft. 1.8003e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	6.9100e+004	2.3422e+003	Co-60	1.2916e+002	4.3780e+000
Eu-154	2.8947e+003	9.8121e+001			

Page : 2
DOS File: 12M_UN.MS4
Run Date: July 8, 1997
Run Time: 2:44 p.m. Tuesday
Title : 12 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.044	2.915e+014	1.067e+001	1.425e+002	3.737e-002	4.989e-001
0.246	7.315e+012	9.095e+000	9.249e+001	1.673e-002	1.702e-001
0.4426	9.960e+011	3.656e+000	2.197e+001	7.160e-003	4.302e-002
0.5907	6.676e+012	4.181e+001	2.004e+002	8.168e-002	3.915e-001
0.6625	2.330e+015	1.805e+004	7.956e+004	3.500e+001	1.542e+002
0.8723	1.503e+013	1.942e+002	7.102e+002	3.653e-001	1.336e+000
1.0024	3.045e+013	5.094e+002	1.712e+003	9.385e-001	3.154e+000
1.2612	4.442e+013	1.139e+003	3.361e+003	2.002e+000	5.909e+000
1.3325	4.779e+012	1.357e+002	3.890e+002	2.354e-001	6.748e-001
1.5767	3.775e+012	1.463e+002	3.860e+002	2.428e-001	6.406e-001
TOTAL:	2.735e+015	2.024e+004	8.657e+004	3.892e+001	1.670e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 12M_U_B.MS4
Run Date: July 8, 1997
Run Time: 2:46 p.m. Tuesday
Duration: 0:01:06

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 12 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1638.0	53.0	8.9
Side Clad:	8362.0	274.0	4.1

Source Volume: 2.95016e+7 cm^3 1041.84 cu ft. 1.8003e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 12M_U_B.MS4
Run Date: July 8, 1997
Run Time: 2:46 p.m. Tuesday
Title : 12 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	9.512e+014	2.433e-008	4.162e-008	2.087e-009	3.570e-009
0.025	4.802e+014	2.511e-001	9.589e-001	4.331e-003	1.654e-002
0.035	3.061e+014	3.844e+000	3.086e+001	2.435e-002	1.955e-001
0.045	2.171e+014	8.614e+000	1.203e+002	2.865e-002	4.000e-001
0.055	1.642e+014	1.188e+001	2.307e+002	2.675e-002	5.193e-001
0.065	1.296e+014	1.392e+001	3.176e+002	2.527e-002	5.765e-001
0.075	1.051e+014	1.517e+001	3.651e+002	2.472e-002	5.951e-001
0.085	8.745e+013	1.605e+001	3.842e+002	2.493e-002	5.969e-001
0.095	7.372e+013	1.661e+001	3.831e+002	2.542e-002	5.863e-001
0.15	3.859e+014	1.970e+002	3.221e+003	3.244e-001	5.304e+000
0.25	1.496e+014	1.916e+002	1.919e+003	3.536e-001	3.540e+000
0.35	7.656e+013	1.821e+002	1.336e+003	3.512e-001	2.577e+000
0.475	6.014e+013	2.515e+002	1.427e+003	4.935e-001	2.800e+000
0.65	3.751e+013	2.806e+002	1.253e+003	5.447e-001	2.433e+000
0.825	1.396e+013	1.626e+002	6.164e+002	3.082e-001	1.168e+000
1.0	9.819e+012	1.635e+002	5.504e+002	3.015e-001	1.014e+000
1.225	5.331e+012	1.295e+002	3.882e+002	2.292e-001	6.871e-001
1.475	1.887e+012	6.467e+001	1.761e+002	1.093e-001	2.977e-001
1.7	4.695e+011	2.089e+001	5.328e+001	3.394e-002	8.654e-002
1.9	1.158e+011	6.319e+000	1.536e+001	9.929e-003	2.413e-002
2.1	1.220e+010	7.985e-001	1.862e+000	1.216e-003	2.836e-003
2.3	6.528e+007	5.040e-003	1.134e-002	7.453e-006	1.676e-005
TOTAL:	3.256e+015	1.737e+003	1.279e+004	3.245e+000	2.342e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 15M_UN.MS4
Run Date: April 3, 1997
Run Time: 5:26 p.m. Thursday
Duration: 0:00:27

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 15min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1831.0	60.0	.9
Side Clad:	8169.0	268.0	.1

Source Volume: 3.68633e+7 cm^3 1301.82 cu ft. 2.24954e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	8.6342e+004	2.3422e+003	Co-60	1.6139e+002	4.3780e+000
Eu-154	3.6171e+003	9.8121e+001			

Page : 2
DOS File: 15M_UN.MS4
Run Date: April 3, 1997
Run Time: 5:26 p.m. Thursday
Title : 15min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	3.209e+014	1.751e+001	2.865e+002	4.799e-002	7.851e-001
0.246	9.140e+012	1.154e+001	1.168e+002	2.123e-002	2.148e-001
0.4426	1.245e+012	4.631e+000	2.772e+001	9.068e-003	5.429e-002
0.5907	8.342e+012	5.291e+001	2.529e+002	1.034e-001	4.940e-001
0.6625	2.911e+015	2.284e+004	1.004e+005	4.428e+001	1.946e+002
0.8723	1.878e+013	2.455e+002	8.960e+002	4.619e-001	1.686e+000
1.0024	3.805e+013	6.439e+002	2.159e+003	1.186e+000	3.979e+000
1.2612	5.550e+013	1.439e+003	4.240e+003	2.530e+000	7.454e+000
1.3325	5.971e+012	1.714e+002	4.907e+002	2.974e-001	8.513e-001
1.5767	4.717e+012	1.848e+002	4.869e+002	3.066e-001	8.080e-001
TOTAL:	3.374e+015	2.561e+004	1.093e+005	4.924e+001	2.109e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 15M_U_B.MS4
Run Date: April 3, 1997
Run Time: 5:29 p.m. Thursday
Duration: 0:01:01

File Ref: _____
Date: ___/___/___
By: _____
Checked: _____

Case Title: 15min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1831.0	60.0	.9
Side Clad:	8169.0	268.0	.1

Source Volume: 3.68633e+7 cm^3 1301.82 cu ft. 2.24954e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 15M_U_B.MS4
Run Date: April 3, 1997
Run Time: 5:29 p.m. Thursday
Title : 15min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	1.189e+015	4.387e-008	7.480e-008	3.763e-009	6.416e-009
0.025	6.000e+014	3.342e-001	1.268e+000	5.764e-003	2.187e-002
0.035	3.825e+014	4.956e+000	3.951e+001	3.140e-002	2.503e-001
0.045	2.713e+014	1.103e+001	1.528e+002	3.668e-002	5.083e-001
0.055	2.051e+014	1.518e+001	2.924e+002	3.416e-002	6.582e-001
0.065	1.620e+014	1.775e+001	4.021e+002	3.223e-002	7.298e-001
0.075	1.313e+014	1.933e+001	4.619e+002	3.150e-002	7.527e-001
0.085	1.093e+014	2.044e+001	4.858e+002	3.175e-002	7.547e-001
0.095	9.212e+013	2.114e+001	4.843e+002	3.235e-002	7.412e-001
0.15	4.821e+014	2.503e+002	4.068e+003	4.122e-001	6.700e+000
0.25	1.869e+014	2.431e+002	2.422e+003	4.485e-001	4.469e+000
0.35	9.566e+013	2.308e+002	1.686e+003	4.452e-001	3.253e+000
0.475	7.515e+013	3.185e+002	1.801e+003	6.249e-001	3.534e+000
0.65	4.687e+013	3.550e+002	1.582e+003	6.892e-001	3.070e+000
0.825	1.745e+013	2.057e+002	7.777e+002	3.897e-001	1.474e+000
1.0	1.227e+013	2.067e+002	6.943e+002	3.811e-001	1.280e+000
1.225	6.662e+012	1.636e+002	4.897e+002	2.896e-001	8.668e-001
1.475	2.358e+012	8.168e+001	2.222e+002	1.381e-001	3.755e-001
1.7	5.866e+011	2.639e+001	6.720e+001	4.286e-002	1.092e-001
1.9	1.447e+011	7.979e+000	1.937e+001	1.254e-002	3.044e-002
2.1	1.524e+010	1.008e+000	2.349e+000	1.535e-003	3.576e-003
2.3	8.157e+007	6.362e-003	1.430e-002	9.408e-006	2.114e-005
TOTAL:	4.068e+015	2.201e+003	1.615e+004	4.111e+000	2.958e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 17M_UN.MS4
Run Date: July 8, 1997
Run Time: 2:58 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 17min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1950.0	63.0	11.7
Side Clad:	8050.0	264.0	1.3

Source Volume: 4.18107e+7 cm^3 1476.53 cu ft. 2.55144e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	9.7929e+004	2.3422e+003	Co-60	1.8305e+002	4.3780e+000
Eu-154	4.1025e+003	9.8121e+001			

Page : 2
DOS File: 17M_UN.MS4
Run Date: July 8, 1997
Run Time: 2:58 p.m. Tuesday
Title : 17min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	3.639e+014	2.019e+001	3.287e+002	5.528e-002	9.002e-001
0.246	1.037e+013	1.322e+001	1.334e+002	2.433e-002	2.454e-001
0.4426	1.412e+012	5.300e+000	3.166e+001	1.038e-002	6.199e-002
0.5907	9.461e+012	6.053e+001	2.887e+002	1.183e-001	5.641e-001
0.6625	3.302e+015	2.613e+004	1.146e+005	5.064e+001	2.222e+002
0.8723	2.130e+013	2.807e+002	1.023e+003	5.281e-001	1.925e+000
1.0024	4.315e+013	7.360e+002	2.465e+003	1.356e+000	4.542e+000
1.2612	6.295e+013	1.644e+003	4.840e+003	2.891e+000	8.509e+000
1.3325	6.773e+012	1.959e+002	5.601e+002	3.399e-001	9.717e-001
1.5767	5.350e+012	2.111e+002	5.557e+002	3.503e-001	9.223e-001
TOTAL:	3.827e+015	2.929e+004	1.248e+005	5.632e+001	2.408e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 17M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:00 p.m. Tuesday
Duration: 0:01:06

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 17 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1950.0	63.0	11.7
Side Clad:	8050.0	264.0	1.3

Source Volume: 4.18107e+7 cm^3 1476.53 cu ft. 2.55144e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 17M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:00 p.m. Tuesday
Title : 17 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	1.348e+015	6.287e-008	1.070e-007	5.392e-009	9.174e-009
0.025	6.806e+014	3.952e-001	1.494e+000	6.817e-003	2.576e-002
0.035	4.338e+014	5.741e+000	4.555e+001	3.637e-002	2.885e-001
0.045	3.077e+014	1.272e+001	1.753e+002	4.229e-002	5.831e-001
0.055	2.327e+014	1.747e+001	3.349e+002	3.931e-002	7.538e-001
0.065	1.837e+014	2.042e+001	4.600e+002	3.706e-002	8.351e-001
0.075	1.489e+014	2.222e+001	5.282e+002	3.621e-002	8.609e-001
0.085	1.239e+014	2.348e+001	5.554e+002	3.647e-002	8.629e-001
0.095	1.045e+014	2.428e+001	5.536e+002	3.715e-002	8.472e-001
0.15	5.469e+014	2.871e+002	4.649e+003	4.729e-001	7.655e+000
0.25	2.120e+014	2.786e+002	2.767e+003	5.140e-001	5.105e+000
0.35	1.085e+014	2.642e+002	1.926e+003	5.097e-001	3.715e+000
0.475	8.523e+013	3.645e+002	2.057e+003	7.152e-001	4.036e+000
0.65	5.316e+013	4.060e+002	1.806e+003	7.883e-001	3.506e+000
0.825	1.979e+013	2.352e+002	8.879e+002	4.456e-001	1.683e+000
1.0	1.392e+013	2.363e+002	7.927e+002	4.356e-001	1.461e+000
1.225	7.556e+012	1.870e+002	5.591e+002	3.310e-001	9.895e-001
1.475	2.674e+012	9.333e+001	2.536e+002	1.577e-001	4.286e-001
1.7	6.654e+011	3.014e+001	7.670e+001	4.896e-002	1.246e-001
1.9	1.642e+011	9.114e+000	2.211e+001	1.432e-002	3.474e-002
2.1	1.729e+010	1.151e+000	2.680e+000	1.753e-003	4.082e-003
2.3	9.252e+007	7.265e-003	1.631e-002	1.074e-005	2.413e-005
TOTAL:	4.614e+015	2.519e+003	1.845e+004	4.707e+000	3.380e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 20M_UN.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 3:05 p.m. Tuesday Checked: _____
Duration: 0:00:29

Case Title: 20 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2115.0	69.0	4.7
Side Clad:	7885.0	258.0	8.3

Source Volume: 4.91857e+7 cm^3 1736.98 cu ft. 3.00149e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	1.1520e+005	2.3422e+003	Co-60	2.1533e+002	4.3780e+000
Eu-154	4.8261e+003	9.8121e+001			

Page : 2
DOS File: 20M_UN.MS4
Run Date: July 8, 1997
Run Time: 3:05 p.m. Tuesday
Title : 20 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	4.281e+014	2.429e+001	3.923e+002	6.654e-002	1.075e+000
0.246	1.219e+013	1.580e+001	1.585e+002	2.906e-002	2.917e-001
0.4426	1.661e+012	6.320e+000	3.762e+001	1.238e-002	7.367e-002
0.5907	1.113e+013	7.213e+001	3.431e+002	1.409e-001	6.702e-001
0.6625	3.885e+015	3.112e+004	1.362e+005	6.033e+001	2.639e+002
0.8723	2.505e+013	3.342e+002	1.215e+003	6.287e-001	2.286e+000
1.0024	5.076e+013	8.760e+002	2.929e+003	1.614e+000	5.396e+000
1.2612	7.405e+013	1.956e+003	5.748e+003	3.439e+000	1.011e+001
1.3325	7.967e+012	2.330e+002	6.652e+002	4.043e-001	1.154e+000
1.5767	6.294e+012	2.510e+002	6.600e+002	4.166e-001	1.095e+000
TOTAL:	4.502e+015	3.489e+004	1.483e+005	6.708e+001	2.861e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 20M_U_B.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 3:07 p.m. Tuesday Checked: _____
Duration: 0:01:05

Case Title: 20 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2115.0	69.0	4.7
Side Clad:	7885.0	258.0	8.3

Source Volume: 4.91857e+7 cm^3 1736.98 cu ft. 3.00149e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 20M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:07 p.m. Tuesday
Title : 20 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	1.586e+015	1.031e-007	1.749e-007	8.847e-009	1.501e-008
0.025	8.006e+014	4.945e-001	1.858e+000	8.529e-003	3.204e-002
0.035	5.103e+014	6.968e+000	5.489e+001	4.414e-002	3.478e-001
0.045	3.619e+014	1.533e+001	2.098e+002	5.098e-002	6.976e-001
0.055	2.737e+014	2.100e+001	3.997e+002	4.727e-002	8.996e-001
0.065	2.161e+014	2.452e+001	5.483e+002	4.450e-002	9.954e-001
0.075	1.752e+014	2.665e+001	6.292e+002	4.344e-002	1.025e+000
0.085	1.458e+014	2.815e+001	6.613e+002	4.373e-002	1.027e+000
0.095	1.229e+014	2.910e+001	6.589e+002	4.453e-002	1.008e+000
0.15	6.433e+014	3.436e+002	5.529e+003	5.658e-001	9.105e+000
0.25	2.494e+014	3.328e+002	3.289e+003	6.139e-001	6.068e+000
0.35	1.276e+014	3.153e+002	2.289e+003	6.083e-001	4.416e+000
0.475	1.003e+014	4.346e+002	2.444e+003	8.527e-001	4.796e+000
0.65	6.254e+013	4.837e+002	2.145e+003	9.391e-001	4.165e+000
0.825	2.328e+013	2.800e+002	1.055e+003	5.306e-001	1.999e+000
1.0	1.637e+013	2.813e+002	9.416e+002	5.184e-001	1.736e+000
1.225	8.889e+012	2.225e+002	6.640e+002	3.938e-001	1.175e+000
1.475	3.146e+012	1.110e+002	3.012e+002	1.876e-001	5.090e-001
1.7	7.827e+011	3.584e+001	9.109e+001	5.821e-002	1.480e-001
1.9	1.931e+011	1.083e+001	2.625e+001	1.702e-002	4.125e-002
2.1	2.034e+010	1.369e+000	3.183e+000	2.084e-003	4.847e-003
2.3	1.088e+008	8.635e-003	1.937e-002	1.277e-005	2.865e-005
TOTAL:	5.428e+015	3.005e+003	2.194e+004	5.615e+000	4.020e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 25M_UN.MS4
Run Date: July 8, 1997
Run Time: 3:09 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 25 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2364.0	77.0	6.7
Side Clad:	7636.0	250.0	6.3

Source Volume: 6.14487e+7 cm^3 2170.04 cu ft. 3.74983e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	1.4393e+005	2.3422e+003	Co-60	2.6902e+002	4.3780e+000
Eu-154	6.0294e+003	9.8121e+001			

Page : 2
DOS File: 25M_UN.MS4
Run Date: July 8, 1997
Run Time: 3:09 p.m. Tuesday
Title : 25 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	5.349e+014	3.153e+001	5.030e+002	8.639e-002	1.378e+000
0.246	1.524e+013	2.025e+001	2.016e+002	3.725e-002	3.708e-001
0.4426	2.075e+012	8.078e+000	4.780e+001	1.582e-002	9.361e-002
0.5907	1.390e+013	9.208e+001	4.358e+002	1.799e-001	8.514e-001
0.6625	4.853e+015	3.971e+004	1.729e+005	7.697e+001	3.352e+002
0.8723	3.130e+013	4.259e+002	1.543e+003	8.014e-001	2.904e+000
1.0024	6.342e+013	1.116e+003	3.719e+003	2.056e+000	6.852e+000
1.2612	9.251e+013	2.490e+003	7.298e+003	4.378e+000	1.283e+001
1.3325	9.954e+012	2.966e+002	8.445e+002	5.145e-001	1.465e+000
1.5767	7.863e+012	3.193e+002	8.377e+002	5.299e-001	1.390e+000
TOTAL:	5.624e+015	4.451e+004	1.884e+005	8.557e+001	3.634e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 25M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:11 p.m. Tuesday
Duration: 0:01:05

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 25 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2364.0	77.0	6.7
Side Clad:	7636.0	250.0	6.3

Source Volume: 6.14487e+7 cm^3 2170.04 cu ft. 3.74983e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 25M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:11 p.m. Tuesday
Title : 25 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	1.981e+015	2.163e-007	3.652e-007	1.855e-008	3.132e-008
0.025	1.000e+015	6.833e-001	2.542e+000	1.179e-002	4.384e-002
0.035	6.375e+014	9.168e+000	7.139e+001	5.808e-002	4.523e-001
0.045	4.522e+014	1.994e+001	2.696e+002	6.633e-002	8.965e-001
0.055	3.419e+014	2.721e+001	5.114e+002	6.124e-002	1.151e+000
0.065	2.700e+014	3.169e+001	7.002e+002	5.753e-002	1.271e+000
0.075	2.189e+014	3.441e+001	8.024e+002	5.608e-002	1.308e+000
0.085	1.821e+014	3.631e+001	8.428e+002	5.640e-002	1.309e+000
0.095	1.536e+014	3.750e+001	8.393e+002	5.739e-002	1.284e+000
0.15	8.037e+014	4.416e+002	7.036e+003	7.271e-001	1.159e+001
0.25	3.116e+014	4.265e+002	4.181e+003	7.869e-001	7.714e+000
0.35	1.595e+014	4.035e+002	2.909e+003	7.783e-001	5.612e+000
0.475	1.253e+014	5.553e+002	3.105e+003	1.089e+000	6.093e+000
0.65	7.813e+013	6.172e+002	2.725e+003	1.198e+000	5.290e+000
0.825	2.908e+013	3.569e+002	1.340e+003	6.764e-001	2.539e+000
1.0	2.045e+013	3.583e+002	1.196e+003	6.605e-001	2.204e+000
1.225	1.110e+013	2.832e+002	8.431e+002	5.013e-001	1.492e+000
1.475	3.931e+012	1.412e+002	3.823e+002	2.387e-001	6.462e-001
1.7	9.779e+011	4.558e+001	1.156e+002	7.404e-002	1.878e-001
1.9	2.413e+011	1.378e+001	3.332e+001	2.164e-002	5.235e-002
2.1	2.541e+010	1.740e+000	4.039e+000	2.649e-003	6.150e-003
2.3	1.360e+008	1.097e-002	2.458e-002	1.623e-005	3.635e-005
TOTAL:	6.782e+015	3.842e+003	2.791e+004	7.180e+000	5.114e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 30M_UN.MS4
Run Date: July 8, 1997
Run Time: 3:14 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 30 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2590.0	84.0	11.7
Side Clad:	7410.0	243.0	1.3

Source Volume: 7.37594e+7 cm^3 2604.79 cu ft. 4.50108e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	µCi/cm^3	Nuclide	curies	µCi/cm^3
Ba-137m	1.7276e+005	2.3422e+003	Co-60	3.2292e+002	4.3780e+000
Eu-154	7.2373e+003	9.8121e+001			

Page : 2
DOS File: 30M_UN.MS4
Run Date: July 8, 1997
Run Time: 3:14 p.m. Tuesday
Title : 30 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	6.420e+014	3.933e+001	6.198e+002	1.078e-001	1.698e+000
0.246	1.829e+013	2.494e+001	2.463e+002	4.588e-002	4.530e-001
0.4426	2.490e+012	9.922e+000	5.837e+001	1.943e-002	1.143e-001
0.5907	1.669e+013	1.130e+002	5.320e+002	2.207e-001	1.039e+000
0.6625	5.826e+015	4.869e+004	2.111e+005	9.438e+001	4.092e+002
0.8723	3.757e+013	5.217e+002	1.883e+003	9.816e-001	3.544e+000
1.0024	7.612e+013	1.366e+003	4.538e+003	2.517e+000	8.361e+000
1.2612	1.110e+014	3.047e+003	8.904e+003	5.356e+000	1.565e+001
1.3325	1.195e+013	3.628e+002	1.030e+003	6.294e-001	1.788e+000
1.5767	9.438e+012	3.904e+002	1.022e+003	6.479e-001	1.696e+000
TOTAL:	6.751e+015	5.456e+004	2.299e+005	1.049e+002	4.435e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 30M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:17 p.m. Tuesday
Duration: 0:01:05

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 30 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2590.0	84.0	11.7
Side Clad:	7410.0	243.0	1.3

Source Volume: 7.37594e+7 cm^3 2604.79 cu ft. 4.50108e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 30M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:17 p.m. Tuesday
Title : 30 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	2.378e+015	4.212e-007	7.083e-007	3.613e-008	6.075e-008
0.025	1.201e+015	9.056e-001	3.336e+000	1.562e-002	5.754e-002
0.035	7.652e+014	1.159e+001	8.922e+001	7.342e-002	5.652e-001
0.045	5.428e+014	2.493e+001	3.329e+002	8.292e-002	1.107e+000
0.055	4.104e+014	3.388e+001	6.289e+002	7.625e-002	1.416e+000
0.065	3.241e+014	3.938e+001	8.593e+002	7.148e-002	1.560e+000
0.075	2.628e+014	4.269e+001	9.835e+002	6.958e-002	1.603e+000
0.085	2.186e+014	4.500e+001	1.032e+003	6.991e-002	1.604e+000
0.095	1.843e+014	4.644e+001	1.027e+003	7.107e-002	1.572e+000
0.15	9.647e+014	5.454e+002	8.604e+003	8.981e-001	1.417e+001
0.25	3.740e+014	5.253e+002	5.108e+003	9.692e-001	9.424e+000
0.35	1.914e+014	4.961e+002	3.553e+003	9.570e-001	6.854e+000
0.475	1.504e+014	6.818e+002	3.792e+003	1.338e+000	7.440e+000
0.65	9.379e+013	7.569e+002	3.326e+003	1.469e+000	6.457e+000
0.825	3.491e+013	4.373e+002	1.635e+003	8.287e-001	3.098e+000
1.0	2.455e+013	4.387e+002	1.459e+003	8.086e-001	2.690e+000
1.225	1.333e+013	3.465e+002	1.029e+003	6.134e-001	1.821e+000
1.475	4.718e+012	1.727e+002	4.664e+002	2.919e-001	7.882e-001
1.7	1.174e+012	5.572e+001	1.410e+002	9.050e-002	2.290e-001
1.9	2.896e+011	1.683e+001	4.063e+001	2.645e-002	6.384e-002
2.1	3.049e+010	2.125e+000	4.925e+000	3.236e-003	7.500e-003
2.3	1.632e+008	1.340e-002	2.997e-002	1.982e-005	4.432e-005
TOTAL:	8.140e+015	4.720e+003	3.412e+004	8.824e+000	6.252e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 35M_UN.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 3:19 p.m. Tuesday Checked: _____
Duration: 0:00:29

Case Title: 35 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2797.0	91.0	9.2
Side Clad:	7203.0	236.0	3.8

Source Volume: 8.60207e+7 cm^3 3037.79 cu ft. 5.2493e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	2.0148e+005	2.3422e+003	Co-60	3.7660e+002	4.3780e+000
Eu-154	8.4404e+003	9.8121e+001			

Page : 2
DOS File: 35M_UN.MS4
Run Date: July 8, 1997
Run Time: 3:19 p.m. Tuesday
Title : 35 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	7.488e+014	4.767e+001	7.420e+002	1.306e-001	2.033e+000
0.246	2.133e+013	2.985e+001	2.923e+002	5.491e-002	5.378e-001
0.4426	2.904e+012	1.184e+001	6.925e+001	2.319e-002	1.356e-001
0.5907	1.947e+013	1.346e+002	6.310e+002	2.630e-001	1.233e+000
0.6625	6.794e+015	5.801e+004	2.503e+005	1.124e+002	4.853e+002
0.8723	4.382e+013	6.209e+002	2.233e+003	1.168e+000	4.202e+000
1.0024	8.878e+013	1.625e+003	5.381e+003	2.995e+000	9.914e+000
1.2612	1.295e+014	3.622e+003	1.056e+004	6.367e+000	1.856e+001
1.3325	1.393e+013	4.311e+002	1.221e+003	7.480e-001	2.119e+000
1.5767	1.101e+013	4.637e+002	1.211e+003	7.696e-001	2.010e+000
TOTAL:	7.874e+015	6.500e+004	2.727e+005	1.250e+002	5.260e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 35M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:22 p.m. Tuesday
Duration: 0:01:05

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 35 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2797.0	91.0	9.2
Side Clad:	7203.0	236.0	3.8

Source Volume: 8.60207e+7 cm^3 3037.79 cu ft. 5.2493e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 35M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:22 p.m. Tuesday
Title : 35 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	2.774e+015	7.728e-007	1.295e-006	6.629e-008	1.111e-007
0.025	1.400e+015	1.163e+000	4.245e+000	2.007e-002	7.322e-002
0.035	8.925e+014	1.423e+001	1.083e+002	9.013e-002	6.860e-001
0.045	6.330e+014	3.028e+001	3.994e+002	1.007e-001	1.328e+000
0.055	4.787e+014	4.098e+001	7.514e+002	9.223e-002	1.691e+000
0.065	3.780e+014	4.753e+001	1.025e+003	8.627e-002	1.860e+000
0.075	3.064e+014	5.146e+001	1.171e+003	8.387e-002	1.909e+000
0.085	2.550e+014	5.419e+001	1.228e+003	8.418e-002	1.908e+000
0.095	2.150e+014	5.588e+001	1.222e+003	8.552e-002	1.870e+000
0.15	1.125e+015	6.544e+002	1.022e+004	1.078e+000	1.683e+001
0.25	4.362e+014	6.287e+002	6.064e+003	1.160e+000	1.119e+001
0.35	2.232e+014	5.927e+002	4.217e+003	1.143e+000	8.134e+000
0.475	1.754e+014	8.134e+002	4.499e+003	1.596e+000	8.827e+000
0.65	1.094e+014	9.018e+002	3.945e+003	1.751e+000	7.658e+000
0.825	4.071e+013	5.206e+002	1.939e+003	9.865e-001	3.674e+000
1.0	2.863e+013	5.218e+002	1.730e+003	9.619e-001	3.189e+000
1.225	1.555e+013	4.120e+002	1.220e+003	7.292e-001	2.158e+000
1.475	5.502e+012	2.052e+002	5.528e+002	3.468e-001	9.343e-001
1.7	1.369e+012	6.617e+001	1.671e+002	1.075e-001	2.715e-001
1.9	3.377e+011	1.999e+001	4.815e+001	3.140e-002	7.566e-002
2.1	3.556e+010	2.523e+000	5.836e+000	3.842e-003	8.886e-003
2.3	1.903e+008	1.591e-002	3.551e-002	2.353e-005	5.251e-005
TOTAL:	9.494e+015	5.635e+003	4.052e+004	1.054e+001	7.428e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 40M_UN.MS4 Date: ___/___/___
Run Date: July 8, 1997 By: _____
Run Time: 3:23 p.m. Tuesday Checked: _____
Duration: 0:00:29

Case Title: 40 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2990.0	98.0	1.2
Side Clad:	7010.0	229.0	11.8

Source Volume: 9.83015e+7 cm^3 3471.49 cu ft. 5.99873e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	µCi/cm^3	Nuclide	curies	µCi/cm^3
Ba-137m	2.3024e+005	2.3422e+003	Co-60	4.3036e+002	4.3780e+000
Eu-154	9.6454e+003	9.8121e+001			

Page : 2
DOS File: 40M_UN.MS4
Run Date: July 8, 1997
Run Time: 3:23 p.m. Tuesday
Title : 40 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	8.557e+014	5.661e+001	8.705e+002	1.551e-001	2.385e+000
0.246	2.437e+013	3.501e+001	3.401e+002	6.442e-002	6.257e-001
0.4426	3.319e+012	1.385e+001	8.053e+001	2.712e-002	1.577e-001
0.5907	2.224e+013	1.573e+002	7.336e+002	3.073e-001	1.433e+000
0.6625	7.764e+015	6.774e+004	2.910e+005	1.313e+002	5.641e+002
0.8723	5.007e+013	7.242e+002	2.596e+003	1.363e+000	4.884e+000
1.0024	1.015e+014	1.895e+003	6.253e+003	3.491e+000	1.152e+001
1.2612	1.480e+014	4.219e+003	1.226e+004	7.418e+000	2.156e+001
1.3325	1.592e+013	5.022e+002	1.419e+003	8.713e-001	2.462e+000
1.5767	1.258e+013	5.399e+002	1.407e+003	8.960e-001	2.335e+000
TOTAL:	8.998e+015	7.588e+004	3.170e+005	1.459e+002	6.115e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 40M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:26 p.m. Tuesday
Duration: 0:01:05

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 40 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2990.0	98.0	1.2
Side Clad:	7010.0	229.0	11.8

Source Volume: 9.83015e+7 cm^3 3471.49 cu ft. 5.99873e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 40M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:26 p.m. Tuesday
Title : 40 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	3.170e+015	1.357e-006	2.266e-006	1.164e-007	1.944e-007
0.025	1.600e+015	1.462e+000	5.286e+000	2.522e-002	9.118e-002
0.035	1.020e+015	1.711e+001	1.288e+002	1.084e-001	8.160e-001
0.045	7.234e+014	3.604e+001	4.697e+002	1.199e-001	1.562e+000
0.055	5.470e+014	4.857e+001	8.799e+002	1.093e-001	1.980e+000
0.065	4.320e+014	5.622e+001	1.197e+003	1.020e-001	2.173e+000
0.075	3.502e+014	6.079e+001	1.367e+003	9.908e-002	2.228e+000
0.085	2.914e+014	6.395e+001	1.433e+003	9.935e-002	2.226e+000
0.095	2.456e+014	6.590e+001	1.425e+003	1.009e-001	2.180e+000
0.15	1.286e+015	7.697e+002	1.190e+004	1.267e+000	1.960e+001
0.25	4.984e+014	7.374e+002	7.055e+003	1.360e+000	1.302e+001
0.35	2.551e+014	6.941e+002	4.905e+003	1.339e+000	9.461e+000
0.475	2.004e+014	9.512e+002	5.231e+003	1.866e+000	1.026e+001
0.65	1.250e+014	1.053e+003	4.585e+003	2.045e+000	8.902e+000
0.825	4.652e+013	6.074e+002	2.253e+003	1.151e+000	4.270e+000
1.0	3.272e+013	6.084e+002	2.011e+003	1.122e+000	3.706e+000
1.225	1.776e+013	4.800e+002	1.417e+003	8.496e-001	2.508e+000
1.475	6.288e+012	2.389e+002	6.422e+002	4.038e-001	1.085e+000
1.7	1.564e+012	7.703e+001	1.941e+002	1.251e-001	3.153e-001
1.9	3.860e+011	2.326e+001	5.593e+001	3.654e-002	8.787e-002
2.1	4.064e+010	2.935e+000	6.777e+000	4.469e-003	1.032e-002
2.3	2.175e+008	1.850e-002	4.123e-002	2.736e-005	6.098e-005
TOTAL:	1.085e+016	6.593e+003	4.717e+004	1.233e+001	8.649e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 43M_UN.MS4
Run Date: July 8, 1997
Run Time: 3:28 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 43 min unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	3100.0	101.0	8.5
Side Clad:	6900.0	226.0	4.5

Source Volume: 1.05667e+8 cm^3 3731.61 cu ft. 6.44822e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	2.4749e+005	2.3422e+003	Co-60	4.6261e+002	4.3780e+000
Eu-154	1.0368e+004	9.8121e+001			

Page : 2
DOS File: 43M_UN.MS4
Run Date: July 8, 1997
Run Time: 3:28 p.m. Tuesday
Title : 43 min unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	9.198e+014	6.227e+001	9.507e+002	1.706e-001	2.605e+000
0.246	2.620e+013	3.824e+001	3.696e+002	7.034e-002	6.799e-001
0.4426	3.568e+012	1.510e+001	8.748e+001	2.957e-002	1.713e-001
0.5907	2.391e+013	1.713e+002	7.968e+002	3.347e-001	1.557e+000
0.6625	8.346e+015	7.377e+004	3.160e+005	1.430e+002	6.126e+002
0.8723	5.383e+013	7.882e+002	2.819e+003	1.483e+000	5.304e+000
1.0024	1.091e+014	2.062e+003	6.790e+003	3.799e+000	1.251e+001
1.2612	1.591e+014	4.588e+003	1.332e+004	8.067e+000	2.341e+001
1.3325	1.712e+013	5.461e+002	1.541e+003	9.475e-001	2.673e+000
1.5767	1.352e+013	5.869e+002	1.527e+003	9.741e-001	2.535e+000
TOTAL:	9.672e+015	8.263e+004	3.442e+005	1.589e+002	6.641e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 43M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:31 p.m. Tuesday
Duration: 0:01:05

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 43 min unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	3100.0	101.0	8.5
Side Clad:	6900.0	226.0	4.5

Source Volume: 1.05667e+8 cm^3 3731.61 cu ft. 6.44822e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 43M_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:31 p.m. Tuesday
Title : 43 min unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	3.407e+015	1.869e-006	3.115e-006	1.604e-007	2.672e-007
0.025	1.720e+015	1.663e+000	5.979e+000	2.868e-002	1.031e-001
0.035	1.096e+015	1.896e+001	1.418e+002	1.201e-001	8.984e-001
0.045	7.776e+014	3.970e+001	5.136e+002	1.320e-001	1.708e+000
0.055	5.880e+014	5.337e+001	9.599e+002	1.201e-001	2.160e+000
0.065	4.643e+014	6.170e+001	1.304e+003	1.120e-001	2.368e+000
0.075	3.764e+014	6.666e+001	1.489e+003	1.086e-001	2.426e+000
0.085	3.132e+014	7.009e+001	1.559e+003	1.089e-001	2.422e+000
0.095	2.640e+014	7.219e+001	1.550e+003	1.105e-001	2.372e+000
0.15	1.382e+015	8.418e+002	1.294e+004	1.386e+000	2.131e+001
0.25	5.358e+014	8.052e+002	7.666e+003	1.486e+000	1.414e+001
0.35	2.742e+014	7.571e+002	5.329e+003	1.460e+000	1.028e+001
0.475	2.154e+014	1.037e+003	5.683e+003	2.034e+000	1.115e+001
0.65	1.344e+014	1.147e+003	4.980e+003	2.227e+000	9.668e+000
0.825	5.001e+013	6.611e+002	2.447e+003	1.253e+000	4.638e+000
1.0	3.517e+013	6.620e+002	2.183e+003	1.220e+000	4.024e+000
1.225	1.910e+013	5.220e+002	1.539e+003	9.240e-001	2.723e+000
1.475	6.759e+012	2.598e+002	6.973e+002	4.390e-001	1.178e+000
1.7	1.682e+012	8.372e+001	2.107e+002	1.360e-001	3.423e-001
1.9	4.149e+011	2.528e+001	6.071e+001	3.971e-002	9.538e-002
2.1	4.369e+010	3.189e+000	7.356e+000	4.856e-003	1.120e-002
2.3	2.338e+008	2.010e-002	4.475e-002	2.973e-005	6.619e-005
TOTAL:	1.166e+016	7.189e+003	5.127e+004	1.345e+001	9.402e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 1H_UNMIT.MS4
Run Date: April 4, 1997
Run Time: 8:24 a.m. Friday
Duration: 0:00:27

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 1hour unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	3662.0	120.0	1.7
Side Clad:	6338.0	207.0	11.3

Source Volume: 1.47453e+8 cm^3 5207.27 cu ft. 8.99815e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	3.4537e+005	2.3422e+003	Co-60	6.4555e+002	4.3780e+000
Eu-154	1.4468e+004	9.8121e+001			

Page : 2
DOS File: 1H_UNMIT.MS4
Run Date: April 4, 1997
Run Time: 8:24 a.m. Friday
Title : 1hour unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	1.284e+015	9.912e+001	1.453e+003	2.716e-001	3.982e+000
0.246	3.656e+013	5.842e+001	5.490e+002	1.075e-001	1.010e+000
0.4426	4.978e+012	2.285e+001	1.298e+002	4.474e-002	2.541e-001
0.5907	3.337e+013	2.582e+002	1.181e+003	5.044e-001	2.306e+000
0.6625	1.165e+016	1.110e+005	4.682e+005	2.151e+002	9.075e+002
0.8723	7.511e+013	1.182e+003	4.173e+003	2.223e+000	7.852e+000
1.0024	1.522e+014	3.085e+003	1.005e+004	5.685e+000	1.852e+001
1.2612	2.220e+014	6.849e+003	1.969e+004	1.204e+001	3.462e+001
1.3325	2.389e+013	8.147e+002	2.278e+003	1.413e+000	3.953e+000
1.5767	1.887e+013	8.741e+002	2.257e+003	1.451e+000	3.746e+000
TOTAL:	1.350e+016	1.242e+005	5.099e+005	2.389e+002	9.838e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 1H_U_B.MS4 Date: __/__/__
Run Date: April 4, 1997 By: _____
Run Time: 8:27 a.m. Friday Checked: _____
Duration: 0:01:01

Case Title: 1hour unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	3662.0	120.0	1.7
Side Clad:	6338.0	207.0	11.3

Source Volume: 1.47453e+8 cm^3 5207.27 cu ft. 8.99815e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 1H_U_B.MS4
Run Date: April 4, 1997
Run Time: 8:27 a.m. Friday
Title : 1hour unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	4.754e+015	9.514e-006	1.570e-005	8.161e-007	1.346e-006
0.025	2.400e+015	3.161e+000	1.104e+001	5.451e-002	1.903e-001
0.035	1.530e+015	3.144e+001	2.266e+002	1.992e-001	1.436e+000
0.045	1.085e+015	6.362e+001	7.908e+002	2.116e-001	2.630e+000
0.055	8.205e+014	8.443e+001	1.458e+003	1.900e-001	3.281e+000
0.065	6.480e+014	9.693e+001	1.967e+003	1.759e-001	3.571e+000
0.075	5.253e+014	1.043e+002	2.236e+003	1.699e-001	3.644e+000
0.085	4.371e+014	1.093e+002	2.336e+003	1.698e-001	3.629e+000
0.095	3.685e+014	1.123e+002	2.318e+003	1.718e-001	3.547e+000
0.15	1.929e+015	1.298e+003	1.929e+004	2.137e+000	3.176e+001
0.25	7.477e+014	1.230e+003	1.139e+004	2.269e+000	2.101e+001
0.35	3.826e+014	1.150e+003	7.909e+003	2.218e+000	1.526e+001
0.475	3.006e+014	1.567e+003	8.427e+003	3.075e+000	1.653e+001
0.65	1.875e+014	1.726e+003	7.377e+003	3.351e+000	1.432e+001
0.825	6.978e+013	9.917e+002	3.623e+003	1.879e+000	6.866e+000
1.0	4.908e+013	9.907e+002	3.231e+003	1.826e+000	5.956e+000
1.225	2.665e+013	7.795e+002	2.276e+003	1.380e+000	4.028e+000
1.475	9.432e+012	3.871e+002	1.031e+003	6.543e-001	1.742e+000
1.7	2.346e+012	1.246e+002	3.113e+002	2.024e-001	5.057e-001
1.9	5.790e+011	3.758e+001	8.966e+001	5.905e-002	1.409e-001
2.1	6.096e+010	4.738e+000	1.086e+001	7.214e-003	1.654e-002
2.3	3.263e+008	2.984e-002	6.605e-002	4.413e-005	9.769e-005
TOTAL:	1.627e+016	1.089e+004	7.630e+004	2.040e+001	1.401e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 2H_UNMIT.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 3:36 p.m. Tuesday Checked: _____
Duration: 0:00:29

Case Title: 2 hour unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	5180.0	169.0	11.4
Side Clad:	4820.0	158.0	1.6

Source Volume: 2.95038e+8 cm^3 10419.2 cu ft. 1.80043e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	6.9104e+005	2.3422e+003	Co-60	1.2917e+003	4.3780e+000
Eu-154	2.8949e+004	9.8121e+001			

Page : 2
DOS File: 2H_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 3:36 p.m. Tuesday
Title : 2 hour unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	2.568e+015	3.189e+002	4.081e+003	8.736e-001	1.118e+001
0.246	7.315e+013	1.640e+002	1.396e+003	3.017e-001	2.568e+000
0.4426	9.961e+012	6.205e+001	3.281e+002	1.215e-001	6.426e-001
0.5907	6.676e+013	6.909e+002	2.978e+003	1.350e+000	5.817e+000
0.6625	2.330e+016	2.954e+005	1.180e+006	5.725e+002	2.286e+003
0.8723	1.503e+014	3.106e+003	1.048e+004	5.843e+000	1.973e+001
1.0024	3.045e+014	8.061e+003	2.521e+004	1.485e+001	4.646e+001
1.2612	4.442e+014	1.773e+004	4.930e+004	3.117e+001	8.668e+001
1.3325	4.779e+013	2.105e+003	5.700e+003	3.652e+000	9.889e+000
1.5767	3.775e+013	2.245e+003	5.636e+003	3.726e+000	9.353e+000
TOTAL:	2.700e+016	3.298e+005	1.285e+006	6.344e+002	2.479e+003

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 2H_U_B.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 3:39 p.m. Tuesday Checked: _____
Duration: 0:01:05

Case Title: 2 hour unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	5180.0	169.0	11.4
Side Clad:	4820.0	158.0	1.6

Source Volume: 2.95038e+8 cm^3 10419.2 cu ft. 1.80043e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 2H_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:39 p.m. Tuesday
Title : 2 hour unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	9.513e+015	7.664e-004	1.225e-003	6.574e-005	1.051e-004
0.025	4.802e+015	1.715e+001	5.467e+001	2.957e-001	9.429e-001
0.035	3.061e+015	1.147e+002	7.330e+002	7.267e-001	4.644e+000
0.045	2.171e+015	2.092e+002	2.275e+003	6.956e-001	7.567e+000
0.055	1.642e+015	2.662e+002	4.002e+003	5.991e-001	9.007e+000
0.065	1.297e+015	2.989e+002	5.268e+003	5.425e-001	9.562e+000
0.075	1.051e+015	3.169e+002	5.905e+003	5.165e-001	9.623e+000
0.085	8.746e+014	3.287e+002	6.113e+003	5.106e-001	9.496e+000
0.095	7.372e+014	3.349e+002	6.025e+003	5.125e-001	9.220e+000
0.15	3.859e+015	3.755e+003	4.948e+004	6.183e+000	8.148e+001
0.25	1.496e+015	3.450e+003	2.894e+004	6.365e+000	5.340e+001
0.35	7.656e+014	3.163e+003	2.004e+004	6.102e+000	3.867e+001
0.475	6.015e+014	4.240e+003	2.130e+004	8.320e+000	4.179e+001
0.65	3.751e+014	4.598e+003	1.859e+004	8.926e+000	3.609e+001
0.825	1.396e+014	2.613e+003	9.109e+003	4.952e+000	1.726e+001
1.0	9.820e+013	2.589e+003	8.108e+003	4.772e+000	1.494e+001
1.225	5.332e+013	2.020e+003	5.698e+003	3.576e+000	1.009e+001
1.475	1.887e+013	9.965e+002	2.575e+003	1.684e+000	4.353e+000
1.7	4.695e+012	3.192e+002	7.766e+002	5.185e-001	1.261e+000
1.9	1.158e+012	9.593e+001	2.233e+002	1.507e-001	3.508e-001
2.1	1.220e+011	1.206e+001	2.701e+001	1.836e-002	4.114e-002
2.3	6.529e+008	7.574e-002	1.641e-001	1.120e-004	2.427e-004
TOTAL:	3.256e+016	2.974e+004	1.952e+005	5.597e+001	3.598e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 3H_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 3:51 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 3 hour unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	6344.0	208.0	1.6
Side Clad:	3656.0	119.0	11.4

Source Volume: 4.42532e+8 cm^3 15627.9 cu ft. 2.70049e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	µCi/cm^3	Nuclide	curies	µCi/cm^3
Ba-137m	1.0365e+006	2.3422e+003	Co-60	1.9374e+003	4.3780e+000
Eu-154	4.3422e+004	9.8121e+001			

Page : 2
DOS File: 3H_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 3:51 p.m. Tuesday
Title : 3 hour unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	3.852e+015	7.907e+002	8.874e+003	2.165e+000	2.430e+001
0.246	1.097e+014	3.586e+002	2.759e+003	6.596e-001	5.075e+000
0.4426	1.494e+013	1.313e+002	6.456e+002	2.572e-001	1.264e+000
0.5907	1.001e+014	1.441e+003	5.845e+003	2.815e+000	1.142e+001
0.6625	3.495e+016	6.126e+005	2.312e+006	1.188e+003	4.483e+003
0.8723	2.254e+014	6.361e+003	2.050e+004	1.197e+001	3.857e+001
1.0024	4.567e+014	1.641e+004	4.922e+004	3.024e+001	9.069e+001
1.2612	6.662e+014	3.577e+004	9.598e+004	6.288e+001	1.687e+002
1.3325	7.168e+013	4.237e+003	1.109e+004	7.351e+000	1.924e+001
1.5767	5.663e+013	4.491e+003	1.094e+004	7.453e+000	1.815e+001
TOTAL:	4.051e+016	6.826e+005	2.518e+006	1.313e+003	4.860e+003

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 3H_U_B.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 3:54 p.m. Tuesday Checked: _____
Duration: 0:01:05

Case Title: 3 hour unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	6344.0	208.0	1.6
Side Clad:	3656.0	119.0	11.4

Source Volume: 4.42532e+8 cm^3 15627.9 cu ft. 2.70049e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 3H_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:54 p.m. Tuesday
Title : 3 hour unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	1.427e+016	2.444e-002	3.761e-002	2.096e-003	3.226e-003
0.025	7.203e+015	6.460e+001	1.894e+002	1.114e+000	3.267e+000
0.035	4.591e+015	3.165e+002	1.811e+003	2.005e+000	1.147e+001
0.045	3.256e+015	5.284e+002	5.062e+003	1.757e+000	1.683e+001
0.055	2.462e+015	6.481e+002	8.500e+003	1.459e+000	1.913e+001
0.065	1.945e+015	7.132e+002	1.092e+004	1.295e+000	1.983e+001
0.075	1.576e+015	7.464e+002	1.208e+004	1.216e+000	1.968e+001
0.085	1.312e+015	7.667e+002	1.239e+004	1.191e+000	1.924e+001
0.095	1.106e+015	7.752e+002	1.214e+004	1.186e+000	1.857e+001
0.15	5.788e+015	8.447e+003	9.850e+004	1.391e+001	1.622e+002
0.25	2.244e+015	7.534e+003	5.720e+004	1.390e+001	1.055e+002
0.35	1.148e+015	6.779e+003	3.952e+004	1.308e+001	7.623e+001
0.475	9.021e+014	8.941e+003	4.187e+004	1.754e+001	8.216e+001
0.65	5.627e+014	9.545e+003	3.645e+004	1.853e+001	7.077e+001
0.825	2.094e+014	5.365e+003	1.782e+004	1.017e+001	3.376e+001
1.0	1.473e+014	5.271e+003	1.583e+004	9.716e+000	2.917e+001
1.225	7.997e+013	4.080e+003	1.110e+004	7.221e+000	1.964e+001
1.475	2.831e+013	1.998e+003	5.003e+003	3.377e+000	8.456e+000
1.7	7.042e+012	6.369e+002	1.506e+003	1.034e+000	2.446e+000
1.9	1.738e+012	1.907e+002	4.322e+002	2.996e-001	6.791e-001
2.1	1.830e+011	2.389e+001	5.221e+001	3.638e-002	7.951e-002
2.3	9.792e+008	1.497e-001	3.168e-001	2.213e-004	4.685e-004
TOTAL:	4.884e+016	6.337e+004	3.884e+005	1.200e+002	7.192e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 4H_UNMIT.MS4
Run Date: July 8. 1997
Run Time: 3:56 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 4 hour unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	7325.0	240.0	3.9
Side Clad:	2675.0	87.0	9.1

Source Volume: 5.89974e+8 cm^3 20834.7 cu ft. 3.60024e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	1.3818e+006	2.3422e+003	Co-60	2.5829e+003	4.3780e+000
Eu-154	5.7889e+004	9.8121e+001			

Page : 2
DOS File: 4H_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 3:56 p.m. Tuesday
Title : 4 hour unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	5.135e+015	1.843e+003	1.801e+004	5.050e+000	4.936e+001
0.246	1.463e+014	7.407e+002	5.130e+003	1.363e+000	9.438e+000
0.4426	1.992e+013	2.626e+002	1.195e+003	5.142e-001	2.341e+000
0.5907	1.335e+014	2.839e+003	1.079e+004	5.546e+000	2.108e+001
0.6625	4.660e+016	1.200e+006	4.265e+006	2.326e+003	8.267e+003
0.8723	3.005e+014	1.230e+004	3.768e+004	2.314e+001	7.089e+001
1.0024	6.089e+014	3.154e+004	9.031e+004	5.811e+001	1.664e+002
1.2612	8.882e+014	6.805e+004	1.755e+005	1.196e+002	3.085e+002
1.3325	9.557e+013	8.042e+003	2.026e+004	1.395e+001	3.514e+001
1.5767	7.549e+013	8.467e+003	1.992e+004	1.405e+001	3.306e+001
TOTAL:	5.400e+016	1.334e+006	4.644e+006	2.567e+003	8.963e+003

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 4H_U_B.MS4 Date: __/__/__
Run Date: July 8, 1997 By: _____
Run Time: 3:58 p.m. Tuesday Checked: _____
Duration: 0:01:04

Case Title: 4 hour unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	7325.0	240.0	3.9
Side Clad:	2675.0	87.0	9.1

Source Volume: 5.89974e+8 cm^3 20834.7 cu ft. 3.60024e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 4H_U_B.MS4
Run Date: July 8, 1997
Run Time: 3:58 p.m. Tuesday
Title : 4 hour unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	1.902e+016	5.146e-001	7.609e-001	4.414e-002	6.527e-002
0.025	9.603e+015	2.180e+002	5.867e+002	3.760e+000	1.012e+001
0.035	6.121e+015	8.146e+002	4.174e+003	5.160e+000	2.644e+001
0.045	4.341e+015	1.255e+003	1.053e+004	4.172e+000	3.502e+001
0.055	3.283e+015	1.486e+003	1.690e+004	3.346e+000	3.804e+001
0.065	2.593e+015	1.605e+003	2.122e+004	2.913e+000	3.852e+001
0.075	2.102e+015	1.659e+003	2.315e+004	2.703e+000	3.773e+001
0.085	1.749e+015	1.688e+003	2.355e+004	2.622e+000	3.659e+001
0.095	1.474e+015	1.694e+003	2.295e+004	2.593e+000	3.512e+001
0.15	7.716e+015	1.795e+004	1.844e+005	2.957e+001	3.036e+002
0.25	2.991e+015	1.555e+004	1.064e+005	2.869e+001	1.962e+002
0.35	1.531e+015	1.373e+004	7.332e+004	2.648e+001	1.414e+002
0.475	1.203e+015	1.781e+004	7.748e+004	3.494e+001	1.520e+002
0.65	7.502e+014	1.871e+004	6.724e+004	3.633e+001	1.305e+002
0.825	2.792e+014	1.040e+004	3.277e+004	1.971e+001	6.211e+001
1.0	1.964e+014	1.013e+004	2.904e+004	1.867e+001	5.353e+001
1.225	1.066e+014	7.772e+003	2.030e+004	1.376e+001	3.593e+001
1.475	3.774e+013	3.777e+003	9.123e+003	6.384e+000	1.542e+001
1.7	9.389e+012	1.197e+003	2.738e+003	1.945e+000	4.447e+000
1.9	2.316e+012	3.569e+002	7.840e+002	5.608e-001	1.232e+000
2.1	2.439e+011	4.455e+001	9.449e+001	6.784e-002	1.439e-001
2.3	1.305e+009	2.782e-001	5.721e-001	4.113e-004	8.460e-004
TOTAL:	6.511e+016	1.278e+005	7.267e+005	2.444e+002	1.354e+003

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 5H_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 4:00 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 5 hour unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	8190.0	268.0	8.4
Side Clad:	1810.0	59.0	4.6

Source Volume: 7.3754e+8 cm^3 26046. cu ft. 4.50075e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	1.7275e+006	2.3422e+003	Co-60	3.2289e+003	4.3780e+000
Eu-154	7.2368e+004	9.8121e+001			

Page : 2
DOS File: 5H_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 4:00 p.m. Tuesday
Title : 5 hour unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	6.420e+015	4.564e+003	3.823e+004	1.250e+001	1.048e+002
0.246	1.829e+014	1.618e+003	9.957e+003	2.976e+000	1.832e+001
0.4426	2.490e+013	5.537e+002	2.307e+003	1.084e+000	4.517e+000
0.5907	1.669e+014	5.890e+003	2.074e+004	1.151e+001	4.052e+001
0.6625	5.825e+016	2.474e+006	8.180e+006	4.796e+003	1.586e+004
0.8723	3.757e+014	2.498e+004	7.185e+004	4.700e+001	1.352e+002
1.0024	7.612e+014	6.358e+004	1.717e+005	1.172e+002	3.163e+002
1.2612	1.110e+015	1.356e+005	3.314e+005	2.383e+002	5.826e+002
1.3325	1.195e+014	1.597e+004	3.818e+004	2.771e+001	6.624e+001
1.5767	9.438e+013	1.667e+004	3.732e+004	2.766e+001	6.194e+001
TOTAL:	6.751e+016	2.743e+006	8.901e+006	5.282e+003	1.719e+004

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 5H_U_B.MS4
Run Date: July 8, 1997
Run Time: 4:03 p.m. Tuesday
Duration: 0:01:04

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 5 hour unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	8190.0	268.0	8.4
Side Clad:	1810.0	59.0	4.6

Source Volume: 7.3754e+8 cm^3 26046. cu ft. 4.50075e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 5H_U_B.MS4
Run Date: July 8, 1997
Run Time: 4:03 p.m. Tuesday
Title : 5 hour unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	2.378e+016	8.499e+000	1.204e+001	7.290e-001	1.033e+000
0.025	1.201e+016	7.691e+002	1.895e+003	1.326e+001	3.269e+001
0.035	7.652e+015	2.225e+003	1.006e+004	1.409e+001	6.371e+001
0.045	5.427e+015	3.163e+003	2.288e+004	1.052e+001	7.611e+001
0.055	4.104e+015	3.619e+003	3.508e+004	8.144e+000	7.896e+001
0.065	3.241e+015	3.832e+003	4.303e+004	6.955e+000	7.812e+001
0.075	2.627e+015	3.909e+003	4.633e+004	6.371e+000	7.550e+001
0.085	2.186e+015	3.941e+003	4.674e+004	6.122e+000	7.260e+001
0.095	1.843e+015	3.924e+003	4.528e+004	6.006e+000	6.929e+001
0.15	9.646e+015	4.041e+004	3.603e+005	6.654e+001	5.934e+002
0.25	3.740e+015	3.393e+004	2.064e+005	6.259e+001	3.808e+002
0.35	1.914e+015	2.935e+004	1.419e+005	5.661e+001	2.737e+002
0.475	1.504e+015	3.741e+004	1.494e+005	7.340e+001	2.931e+002
0.65	9.378e+014	3.862e+004	1.290e+005	7.498e+001	2.505e+002
0.825	3.490e+014	2.119e+004	6.258e+004	4.015e+001	1.186e+002
1.0	2.455e+014	2.043e+004	5.520e+004	3.765e+001	1.017e+002
1.225	1.333e+014	1.550e+004	3.837e+004	2.744e+001	6.791e+001
1.475	4.718e+013	7.463e+003	1.714e+004	1.261e+001	2.896e+001
1.7	1.174e+013	2.348e+003	5.115e+003	3.813e+000	8.308e+000
1.9	2.896e+012	6.958e+002	1.458e+003	1.093e+000	2.291e+000
2.1	3.049e+011	8.638e+001	1.751e+002	1.315e-001	2.666e-001
2.3	1.632e+009	5.367e-001	1.056e+000	7.937e-004	1.561e-003
TOTAL:	8.140e+016	2.728e+005	1.418e+006	5.292e+002	2.668e+003

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 6H_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 4:04 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 6 hour unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	8971.0	294.0	3.9
Side Clad:	1029.0	33.0	9.1

Source Volume: 8.84911e+8 cm^3 31250.3 cu ft. 5.40006e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	2.0726e+006	2.3422e+003	Co-60	3.8741e+003	4.3780e+000
Eu-154	8.6828e+004	9.8121e+001			

Page : 2
DOS File: 6H_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 4:04 p.m. Tuesday
Title : 6 hour unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	7.703e+015	1.360e+004	9.600e+004	3.725e+001	2.630e+002
0.246	2.194e+014	4.240e+003	2.258e+004	7.800e+000	4.154e+001
0.4426	2.988e+013	1.395e+003	5.155e+003	2.732e+000	1.010e+001
0.5907	2.002e+014	1.455e+004	4.590e+004	2.843e+001	8.968e+001
0.6625	6.989e+016	6.063e+006	1.802e+007	1.175e+004	3.493e+004
0.8723	4.508e+014	6.001e+004	1.563e+005	1.129e+002	2.942e+002
1.0024	9.133e+014	1.512e+005	3.709e+005	2.785e+002	6.833e+002
1.2612	1.332e+015	3.165e+005	7.067e+005	5.564e+002	1.242e+003
1.3325	1.433e+014	3.713e+004	8.115e+004	6.441e+001	1.408e+002
1.5767	1.132e+014	3.820e+004	7.848e+004	6.340e+001	1.302e+002
TOTAL:	8.100e+016	6.700e+006	1.958e+007	1.291e+004	3.783e+004

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 6H_U_B.MS4
Run Date: July 8, 1997
Run Time: 4:06 p.m. Tuesday
Duration: 0:01:04

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 6 hour unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	8971.0	294.0	3.9
Side Clad:	1029.0	33.0	9.1

Source Volume: 8.84911e+8 cm^3 31250.3 cu ft. 5.40006e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 6H_U_B.MS4
Run Date: July 8, 1997
Run Time: 4:06 p.m. Tuesday
Title : 6 hour unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	2.853e+016	1.173e+002	1.593e+002	1.006e+001	1.366e+001
0.025	1.440e+016	3.180e+003	7.139e+003	5.485e+001	1.231e+002
0.035	9.181e+015	7.288e+003	2.875e+004	4.617e+001	1.821e+002
0.045	6.512e+015	9.591e+003	5.892e+004	3.190e+001	1.959e+002
0.055	4.924e+015	1.060e+004	8.608e+004	2.386e+001	1.937e+002
0.065	3.889e+015	1.101e+004	1.030e+005	1.999e+001	1.871e+002
0.075	3.152e+015	1.109e+004	1.094e+005	1.807e+001	1.783e+002
0.085	2.623e+015	1.107e+004	1.094e+005	1.720e+001	1.699e+002
0.095	2.211e+015	1.094e+004	1.053e+005	1.674e+001	1.611e+002
0.15	1.157e+016	1.093e+005	8.270e+005	1.800e+002	1.362e+003
0.25	4.487e+015	8.882e+004	4.679e+005	1.639e+002	8.633e+002
0.35	2.296e+015	7.514e+004	3.193e+005	1.449e+002	6.159e+002
0.475	1.804e+015	9.381e+004	3.331e+005	1.841e+002	6.536e+002
0.65	1.125e+015	9.479e+004	2.845e+005	1.840e+002	5.523e+002
0.825	4.188e+014	5.111e+004	1.365e+005	9.686e+001	2.587e+002
1.0	2.945e+014	4.857e+004	1.193e+005	8.953e+001	2.199e+002
1.225	1.599e+014	3.628e+004	8.196e+004	6.422e+001	1.451e+002
1.475	5.660e+013	1.720e+004	3.619e+004	2.907e+001	6.116e+001
1.7	1.408e+013	5.346e+003	1.070e+004	8.683e+000	1.738e+001
1.9	3.474e+012	1.569e+003	3.027e+003	2.465e+000	4.756e+000
2.1	3.659e+011	1.931e+002	3.608e+002	2.940e-001	5.494e-001
2.3	1.958e+009	1.190e+000	2.162e+000	1.759e-003	3.197e-003
TOTAL:	9.766e+016	6.970e+005	3.228e+006	1.387e+003	6.159e+003

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 7H_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 4:08 p.m. Tuesday
Duration: 0:00:29

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 7 hour unmit 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	9690.0	317.0	11.0
Side Clad:	310.0	10.0	2.0

Source Volume: 1.03244e+9 cm^3 36460.3 cu ft. 6.30034e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	2.4182e+006	2.3422e+003	Co-60	4.5200e+003	4.3780e+000
Eu-154	1.0130e+005	9.8121e+001			

Page : 2
DOS File: 7H_UNMIT.MS4
Run Date: July 8, 1997
Run Time: 4:08 p.m. Tuesday
Title : 7 hour unmit 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0493	8.987e+015	4.828e+004	2.929e+005	1.323e+002	8.025e+002
0.246	2.560e+014	1.351e+004	6.000e+004	2.486e+001	1.104e+002
0.4426	3.486e+013	4.265e+003	1.335e+004	8.353e+000	2.614e+001
0.5907	2.336e+014	4.346e+004	1.171e+005	8.489e+001	2.288e+002
0.6625	8.154e+016	1.793e+007	4.569e+007	3.475e+004	8.856e+004
0.8723	5.259e+014	1.730e+005	3.896e+005	3.255e+002	7.330e+002
1.0024	1.066e+015	4.297e+005	9.158e+005	7.918e+002	1.687e+003
1.2612	1.554e+015	8.781e+005	1.716e+006	1.544e+003	3.018e+003
1.3325	1.672e+014	1.024e+005	1.963e+005	1.776e+002	3.405e+002
1.5767	1.321e+014	1.034e+005	1.873e+005	1.716e+002	3.108e+002
TOTAL:	9.450e+016	1.972e+007	4.957e+007	3.801e+004	9.582e+004

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 7H_U_B.MS4
Run Date: July 8, 1997
Run Time: 4:10 p.m. Tuesday
Duration: 0:01:04

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 7 hour unmit 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	9690.0	317.0	11.0
Side Clad:	310.0	10.0	2.0

Source Volume: 1.03244e+9 cm^3 36460.3 cu ft. 6.30034e+7 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 7H_U_B.MS4
Run Date: July 8, 1997
Run Time: 4:10 p.m. Tuesday
Title : 7 hour unmit 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	3.329e+016	1.148e+003	1.496e+003	9.847e+001	1.284e+002
0.025	1.681e+016	1.430e+004	2.970e+004	2.466e+002	5.122e+002
0.035	1.071e+016	2.778e+004	9.739e+004	1.760e+002	6.170e+002
0.045	7.597e+015	3.452e+004	1.835e+005	1.148e+002	6.102e+002
0.055	5.745e+015	3.716e+004	2.573e+005	8.364e+001	5.790e+002
0.065	4.537e+015	3.801e+004	3.003e+005	6.899e+001	5.451e+002
0.075	3.678e+015	3.788e+004	3.135e+005	6.174e+001	5.109e+002
0.085	3.060e+015	3.752e+004	3.094e+005	5.829e+001	4.807e+002
0.095	2.580e+015	3.683e+004	2.950e+005	5.637e+001	4.515e+002
0.15	1.350e+016	3.589e+005	2.253e+006	5.910e+002	3.711e+003
0.25	5.235e+015	2.828e+005	1.243e+006	5.217e+002	2.292e+003
0.35	2.679e+015	2.337e+005	8.358e+005	4.509e+002	1.612e+003
0.475	2.105e+015	2.852e+005	8.594e+005	5.596e+002	1.686e+003
0.65	1.313e+015	2.807e+005	7.220e+005	5.450e+002	1.402e+003
0.825	4.886e+014	1.481e+005	3.414e+005	2.807e+002	6.469e+002
1.0	3.436e+014	1.381e+005	2.946e+005	2.546e+002	5.430e+002
1.225	1.866e+014	1.010e+005	1.995e+005	1.788e+002	3.532e+002
1.475	6.604e+013	4.690e+004	8.682e+004	7.927e+001	1.467e+002
1.7	1.643e+013	1.434e+004	2.537e+004	2.330e+001	4.121e+001
1.9	4.054e+012	4.156e+003	7.112e+003	6.529e+000	1.117e+001
2.1	4.268e+011	5.053e+002	8.405e+002	7.695e-001	1.280e+000
2.3	2.285e+009	3.080e+000	4.997e+000	4.555e-003	7.390e-003
TOTAL:	1.139e+017	2.160e+006	8.656e+006	4.457e+003	1.688e+004

ATTACHMENT 2: UNMITIGATED ACCIDENT MICROSKYSHINE RUNS

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 1M_UNMIT.SKY
Run: Input only
:

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 1 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	94.27
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	5.73
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	4.73
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 1 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	5.7619e+03	Co-60	1.0770e+01
Eu-154	2.4138e+02		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	3.975e+12	4.718e-20	7.733e-01
2	1.03	2.981e+12	5.075e-20	6.237e-01
3	.84	1.640e+12	5.010e-20	3.388e-01
4	.66	1.944e+14	5.371e-20	4.306e+01
5	.48	8.718e+10	5.776e-20	2.076e-02
6	.40	1.870e+10	5.674e-20	4.376e-03
7	.24	5.896e+11	5.708e-20	1.388e-01
8	.20	2.029e+10	5.586e-20	4.673e-03
9	.12	3.614e+12	4.892e-20	7.290e-01
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		2.074e+14		4.570e+01

MicroSkyshine
==========

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 1M_U_B.SKY
Run: 1:27 p.m.
: April 4, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 1 minute 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	94.27
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	5.73
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	4.73
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 1 minute 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	9.659e+09	4.175e-20	1.663e-03
2	1.70	3.915e+10	4.193e-20	6.769e-03
3	1.48	1.574e+11	4.210e-20	2.732e-02
4	1.23	4.446e+11	4.877e-20	8.940e-02
5	1.00	8.188e+11	5.079e-20	1.715e-01
6	.82	1.164e+12	4.991e-20	2.396e-01
7	.65	3.128e+12	5.433e-20	7.007e-01
8	.47	5.015e+12	5.776e-20	1.194e+00
9	.35	6.384e+12	5.547e-20	1.460e+00
10	.25	1.247e+13	5.707e-20	2.935e+00
11	.15	3.218e+13	5.299e-20	7.031e+00
12				
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	TOTALS:	6.181e+13		1.386e+01

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 2M_UNMIT.SKY
Run: Input only
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File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 2 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	92.31
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	7.69
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	6.69
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 2 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.1524e+04	Co-60	2.1540e+01
Eu-154	4.8276e+02		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	7.951e+12	5.191e-20	1.702e+00
2	1.03	5.961e+12	5.539e-20	1.362e+00
3	.84	3.280e+12	5.448e-20	7.367e-01
4	.66	3.889e+14	5.792e-20	9.288e+01
5	.48	1.744e+11	6.173e-20	4.438e-02
6	.40	3.741e+10	6.045e-20	9.324e-03
7	.24	1.179e+12	6.022e-20	2.928e-01
8	.20	4.058e+10	5.872e-20	9.825e-03
9	.12	7.228e+12	5.114e-20	1.524e+00
10				
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20				
TOTALS:		4.147e+14		9.856e+01

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 2M_U_B.SKY
Run: Input only
:

File Ref: _____
Date: ___/___/___
By: _____
Checked: _____

CASE: 2 minute 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	92.31
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	7.69
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	6.69
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 2 minute 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	1.932e+10	4.657e-20	3.710e-03
2	1.70	7.830e+10	4.666e-20	1.506e-02
3	1.48	3.148e+11	4.667e-20	6.058e-02
4	1.23	8.892e+11	5.351e-20	1.962e-01
5	1.00	1.638e+12	5.540e-20	3.741e-01
6	.82	2.328e+12	5.425e-20	5.208e-01
7	.65	6.256e+12	5.853e-20	1.510e+00
8	.47	1.003e+13	6.171e-20	2.552e+00
9	.35	1.277e+13	5.901e-20	3.107e+00
10	.25	2.494e+13	6.024e-20	6.195e+00
11	.15	6.436e+13	5.554e-20	1.474e+01
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20				
	TOTALS:	1.236e+14		2.927e+01

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 5M_UNMIT.SKY
Run: Input only
:

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 5 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	88.43
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	11.57
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	10.57
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

CASE: 5 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.8809e+04	Co-60	5.3850e+01
Eu-154	1.2069e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.988e+13	5.724e-20	4.691e+00
2	1.03	1.490e+13	6.054e-20	3.720e+00
3	.84	8.199e+12	5.928e-20	2.004e+00
4	.66	9.722e+14	6.249e-20	2.505e+02
5	.48	4.359e+11	6.597e-20	1.186e-01
6	.40	9.352e+10	6.440e-20	2.483e-02
7	.24	2.948e+12	6.352e-20	7.722e-01
8	.20	1.014e+11	6.174e-20	2.582e-02
9	.12	1.807e+13	5.347e-20	3.984e+00
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TOTALS:		1.037e+15		2.659e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 5M_U_B.SKY
Run: 10:16 a.m.
: July 3, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 5 minute 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	88.43
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	11.57
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	10.57
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

CASE: 5 minute 67/33 betas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.8809e+04	Co-60	5.3850e+01
Eu-154	1.2069e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	4.829e+10	5.216e-20	1.039e-02
2	1.70	1.958e+11	5.210e-20	4.206e-02
3	1.48	7.870e+11	5.190e-20	1.684e-01
4	1.23	2.223e+12	5.884e-20	5.394e-01
5	1.00	4.094e+12	6.051e-20	1.021e+00
6	.82	5.820e+12	5.902e-20	1.416e+00
7	.65	1.564e+13	6.309e-20	4.069e+00
8	.47	2.507e+13	6.593e-20	6.816e+00
9	.35	3.192e+13	6.276e-20	8.260e+00
10	.25	6.234e+13	6.359e-20	1.635e+01
11	.15	1.609e+14	5.821e-20	3.862e+01
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20				
	TOTALS:	3.090e+14		7.731e+01

MicroSkyshine
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(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 7M_UNMIT.SKY Date: __/__/__
Run: Input only By: _____
: Checked: _____

CASE: 7 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	86.49
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	13.51
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	12.51
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

CASE: 7 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	4.0333e+04	Co-60	7.5390e+01
Eu-154	1.6897e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	2.783e+13	5.890e-20	6.758e+00
2	1.03	2.086e+13	6.213e-20	5.345e+00
3	.84	1.148e+13	6.075e-20	2.876e+00
4	.66	1.361e+15	6.389e-20	3.586e+02
5	.48	6.102e+11	6.725e-20	1.692e-01
6	.40	1.309e+11	6.559e-20	3.541e-02
7	.24	4.127e+12	6.453e-20	1.098e+00
8	.20	1.420e+11	6.266e-20	3.669e-02
9	.12	2.530e+13	5.419e-20	5.652e+00
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TOTALS:		1.452e+15		3.805e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 7M_U_B.SKY Date: ___/___/___
Run: 10:23 a.m. By: _____
: July 3, 1997 Checked: _____

CASE: 7 minute 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	86.49
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	13.51
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	12.51
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

CASE: 7 minute 67/33 betas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.8809e+04	Co-60	5.3850e+01
Eu-154	1.2069e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	6.761e+10	5.393e-20	1.503e-02
2	1.70	2.741e+11	5.381e-20	6.082e-02
3	1.48	1.102e+12	5.353e-20	2.432e-01
4	1.23	3.112e+12	6.050e-20	7.763e-01
5	1.00	5.732e+12	6.208e-20	1.467e+00
6	.82	8.148e+12	6.047e-20	2.032e+00
7	.65	2.190e+13	6.448e-20	5.823e+00
8	.47	3.510e+13	6.721e-20	9.727e+00
9	.35	4.469e+13	6.388e-20	1.177e+01
10	.25	8.729e+13	6.460e-20	2.325e+01
11	.15	2.253e+14	5.903e-20	5.484e+01
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20				
TOTALS:		4.327e+14		1.100e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 10M_UNMT.SKY Date: __/__/__
Run: 10:43 a.m. By: _____
: July 3, 1997 Checked: _____

CASE: 10 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	84.05
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	15.95
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	14.95
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 10 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	5.7619e+04	Co-60	1.0770e+02
Eu-154	2.4138e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	3.975e+13	6.049e-20	9.915e+00
2	1.03	2.981e+13	6.364e-20	7.822e+00
3	.84	1.640e+13	6.216e-20	4.203e+00
4	.66	1.944e+15	6.521e-20	5.229e+02
5	.48	8.718e+11	6.847e-20	2.461e-01
6	.40	1.870e+11	6.672e-20	5.146e-02
7	.24	5.896e+12	6.550e-20	1.593e+00
8	.20	2.029e+11	6.356e-20	5.317e-02
9	.12	3.614e+13	5.490e-20	8.180e+00
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20				
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	TOTALS:	2.074e+15		5.549e+02

MicroSkyshine
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(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 10M_U_B.SKY Date: ___/___/___
Run: 10:51 a.m. By: _____
: July 3, 1997 Checked: _____

CASE: 10 minute 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	84.05
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	15.95
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	14.95
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 10 minute 67/33 betas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.8809e+04	Co-60	5.3850e+01
Eu-154	1.2069e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	9.659e+10	5.563e-20	2.216e-02
2	1.70	3.915e+11	5.545e-20	8.952e-02
3	1.48	1.574e+12	5.510e-20	3.576e-01
4	1.23	4.446e+12	6.208e-20	1.138e+00
5	1.00	8.188e+12	6.358e-20	2.146e+00
6	.82	1.164e+13	6.186e-20	2.969e+00
7	.65	3.128e+13	6.581e-20	8.488e+00
8	.47	5.015e+13	6.843e-20	1.415e+01
9	.35	6.384e+13	6.496e-20	1.710e+01
10	.25	1.247e+14	6.559e-20	3.373e+01
11	.15	3.218e+14	5.984e-20	7.941e+01
12				
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20				
TOTALS:		6.181e+14		1.596e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 12M_UNMT.SKY Date: __/__/__
Run: 11:00 a.m. By: _____
: July 3, 1997 Checked: _____

CASE: 12 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	82.62
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	17.38
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	16.38
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....M		5
Number of Circumferential Segments.....N		5
Number of Vertical Segments.....C		5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 12 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	6.9143e+04	Co-60	1.2924e+02
Eu-154	2.8966e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	4.770e+13	6.125e-20	1.205e+01
2	1.03	3.577e+13	6.437e-20	9.493e+00
3	.84	1.968e+13	6.283e-20	5.098e+00
4	.66	2.333e+15	6.585e-20	6.335e+02
5	.48	1.046e+12	6.906e-20	2.979e-01
6	.40	2.244e+11	6.727e-20	6.225e-02
7	.24	7.076e+12	6.598e-20	1.925e+00
8	.20	2.435e+11	6.400e-20	6.425e-02
9	.12	4.337e+13	5.525e-20	9.880e+00
10				
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20				
	TOTALS:	2.488e+15		6.724e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 12M_U_B.SKY
Run: 11:07 a.m.
: July 3, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 12 minute 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	82.62
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	17.38
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	16.38
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 12 minute 67/33 betas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.8809e+04	Co-60	5.3850e+01
Eu-154	1.2069e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	1.159e+11	5.645e-20	2.698e-02
2	1.70	4.698e+11	5.625e-20	1.090e-01
3	1.48	1.889e+12	5.585e-20	4.350e-01
4	1.23	5.335e+12	6.283e-20	1.382e+00
5	1.00	9.826e+12	6.429e-20	2.605e+00
6	.82	1.397e+13	6.253e-20	3.602e+00
7	.65	3.754e+13	6.644e-20	1.028e+01
8	.47	6.018e+13	6.901e-20	1.712e+01
9	.35	7.661e+13	6.548e-20	2.068e+01
10	.25	1.496e+14	6.607e-20	4.075e+01
11	.15	3.862e+14	6.024e-20	9.593e+01
12				
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19				
20				
TOTALS:		7.417e+14		1.929e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 15M_UN.SKY
Run: 12:37 p.m.
: April 5, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 15 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	80.69
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	19.31
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	18.31
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 15 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	8.6428e+04	Co-60	1.6155e+02
Eu-154	3.6207e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	5.963e+13	6.215e-20	1.528e+01
2	1.03	4.471e+13	6.522e-20	1.202e+01
3	.84	2.460e+13	6.362e-20	6.452e+00
4	.66	2.917e+15	6.659e-20	8.009e+02
5	.48	1.308e+12	6.975e-20	3.761e-01
6	.40	2.806e+11	6.791e-20	7.856e-02
7	.24	8.845e+12	6.655e-20	2.427e+00
8	.20	3.043e+11	6.454e-20	8.099e-02
9	.12	5.421e+13	5.568e-20	1.245e+01
10				
11				
12				
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15				
16				
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19				
20				
TOTALS:		3.111e+15		8.501e+02

MicroSkyshine
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(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 15M_U_B.SKY Date: ___/___/___
Run: 12:40 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 15 minute unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	80.69
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	19.31
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	18.31
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 15 minute unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	1.449e+11	5.742e-20	3.431e-02
2	1.70	5.873e+11	5.719e-20	1.385e-01
3	1.48	2.361e+12	5.674e-20	5.524e-01
4	1.23	6.669e+12	6.373e-20	1.752e+00
5	1.00	1.228e+13	6.514e-20	3.299e+00
6	.82	1.746e+13	6.331e-20	4.558e+00
7	.65	4.692e+13	6.718e-20	1.300e+01
8	.47	7.522e+13	6.970e-20	2.162e+01
9	.35	9.576e+13	6.608e-20	2.609e+01
10	.25	1.870e+14	6.664e-20	5.140e+01
11	.15	4.827e+14	6.073e-20	1.209e+02
12				
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20				
TOTALS:		9.272e+14		2.433e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 17M_UN.SKY Date: __/__/__
Run: 12:42 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 17 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	79.5
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	20.5
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	19.5
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 17 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	9.7952e+04	Co-60	1.8309e+02
Eu-154	4.1035e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	6.758e+13	6.263e-20	1.745e+01
2	1.03	5.067e+13	6.568e-20	1.372e+01
3	.84	2.788e+13	6.404e-20	7.361e+00
4	.66	3.306e+15	6.700e-20	9.132e+02
5	.48	1.482e+12	7.012e-20	4.285e-01
6	.40	3.180e+11	6.826e-20	8.949e-02
7	.24	1.002e+13	6.687e-20	2.764e+00
8	.20	3.449e+11	6.484e-20	9.222e-02
9	.12	6.144e+13	5.593e-20	1.417e+01
10				
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20				
TOTALS:		3.525e+15		9.693e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 17M_U_B.SKY Date: __/__/__
Run: 12:48 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 17 minute unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	79.5
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	20.5
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	19.5
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 17 minute unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	1.642e+11	5.794e-20	3.923e-02
2	1.70	6.655e+11	5.769e-20	1.583e-01
3	1.48	2.676e+12	5.722e-20	6.313e-01
4	1.23	7.558e+12	6.421e-20	2.001e+00
5	1.00	1.392e+13	6.559e-20	3.765e+00
6	.82	1.979e+13	6.373e-20	5.200e+00
7	.65	5.318e+13	6.758e-20	1.482e+01
8	.47	8.526e+13	7.007e-20	2.463e+01
9	.35	1.085e+14	6.642e-20	2.972e+01
10	.25	2.120e+14	6.696e-20	5.853e+01
11	.15	5.471e+14	6.101e-20	1.376e+02
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20				
TOTALS:		1.051e+15		2.771e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 20M_UN.SKY Date: ___/___/___
Run: 12:51 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 20 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	77.85
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	22.15
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	21.15
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 20 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.1524e+05	Co-60	2.1540e+02
Eu-154	4.8276e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	7.951e+13	6.323e-20	2.073e+01
2	1.03	5.961e+13	6.626e-20	1.629e+01
3	.84	3.280e+13	6.457e-20	8.732e+00
4	.66	3.889e+15	6.750e-20	1.082e+03
5	.48	1.744e+12	7.059e-20	5.075e-01
6	.40	3.741e+11	6.870e-20	1.060e-01
7	.24	1.179e+13	6.728e-20	3.271e+00
8	.20	4.058e+11	6.524e-20	1.092e-01
9	.12	7.228e+13	5.626e-20	1.677e+01
10				
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20				
	TOTALS:	4.147e+15		1.149e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 20M_U_B.SKY Date: __/__/__
Run: 12:45 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 20 minute unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	77.85
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	22.15
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	21.15
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 20 minute unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	1.932e+11	5.859e-20	4.667e-02
2	1.70	7.830e+11	5.832e-20	1.883e-01
3	1.48	3.148e+12	5.782e-20	7.505e-01
4	1.23	8.892e+12	6.481e-20	2.376e+00
5	1.00	1.638e+13	6.616e-20	4.468e+00
6	.82	2.328e+13	6.426e-20	6.168e+00
7	.65	6.256e+13	6.809e-20	1.756e+01
8	.47	1.003e+14	7.054e-20	2.917e+01
9	.35	1.277e+14	6.683e-20	3.519e+01
10	.25	2.494e+14	6.737e-20	6.929e+01
11	.15	6.436e+14	6.138e-20	1.629e+02
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20				
TOTALS:		1.236e+15		3.281e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 25M_UN.SKY Date: ___/___/___
Run: 12:53 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 25 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	75.36
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	24.64
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	23.64
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 25 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.4405e+05	Co-60	2.6925e+02
Eu-154	6.0345e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	9.938e+13	6.403e-20	2.624e+01
2	1.03	7.451e+13	6.702e-20	2.059e+01
3	.84	4.100e+13	6.527e-20	1.103e+01
4	.66	4.861e+15	6.818e-20	1.367e+03
5	.48	2.179e+12	7.123e-20	6.401e-01
6	.40	4.676e+11	6.929e-20	1.336e-01
7	.24	1.474e+13	6.785e-20	4.124e+00
8	.20	5.072e+11	6.579e-20	1.376e-01
9	.12	9.035e+13	5.673e-20	2.114e+01
10				
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19				
20				
TOTALS:		5.184e+15		1.451e+03

MicroSkyshine
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(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 25M_U_B.SKY Date: ___/___/___
Run: 12:56 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 25 minute unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	75.36
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	24.64
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	23.64
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 25 minute unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	2.415e+11	5.945e-20	5.919e-02
2	1.70	9.788e+11	5.914e-20	2.387e-01
3	1.48	3.935e+12	5.860e-20	9.508e-01
4	1.23	1.112e+13	6.560e-20	3.006e+00
5	1.00	2.047e+13	6.691e-20	5.648e+00
6	.82	2.910e+13	6.495e-20	7.793e+00
7	.65	7.820e+13	6.876e-20	2.217e+01
8	.47	1.254e+14	7.117e-20	3.679e+01
9	.35	1.596e+14	6.740e-20	4.436e+01
10	.25	3.118e+14	6.795e-20	8.735e+01
11	.15	8.045e+14	6.190e-20	2.053e+02
12				
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20				
TOTALS:		1.545e+15		4.137e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____

File: 30M_UN.SKY Date: ___/___/___

Run: 12:59 p.m. By: _____

: April 5, 1997 Checked: _____

CASE: 30 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	73.1
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	26.9
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	25.9
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 30 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.7286e+05	Co-60	3.2310e+02
Eu-154	7.2414e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.193e+14	6.465e-20	3.179e+01
2	1.03	8.942e+13	6.761e-20	2.493e+01
3	.84	4.920e+13	6.583e-20	1.335e+01
4	.66	5.833e+15	6.871e-20	1.653e+03
5	.48	2.615e+12	7.174e-20	7.737e-01
6	.40	5.611e+11	6.978e-20	1.614e-01
7	.24	1.769e+13	6.834e-20	4.985e+00
8	.20	6.087e+11	6.628e-20	1.663e-01
9	.12	1.084e+14	5.715e-20	2.555e+01
10				
11				
12				
13				
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15				
16				
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18				
19				
20				
TOTALS:		6.221e+15		1.755e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 30M_U_B.SKY Date: ___/___/___
Run: 1:02 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 30 minute unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	73.1
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	26.9
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	25.9
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 30 minute unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	2.898e+11	6.011e-20	7.183e-02
2	1.70	1.174e+12	5.978e-20	2.895e-01
3	1.48	4.722e+12	5.921e-20	1.153e+00
4	1.23	1.334e+13	6.622e-20	3.642e+00
5	1.00	2.456e+13	6.751e-20	6.837e+00
6	.82	3.492e+13	6.550e-20	9.431e+00
7	.65	9.384e+13	6.930e-20	2.682e+01
8	.47	1.505e+14	7.169e-20	4.447e+01
9	.35	1.915e+14	6.786e-20	5.359e+01
10	.25	3.741e+14	6.844e-20	1.056e+02
11	.15	9.654e+14	6.236e-20	2.482e+02
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		1.854e+15		5.001e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 35M_UN.SKY Date: ___/___/___
Run: 1:04 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 35 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	71.03
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	28.97
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	27.97
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 35 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.0167e+05	Co-60	3.7695e+02
Eu-154	8.4483e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.391e+14	6.516e-20	3.738e+01
2	1.03	1.043e+14	6.811e-20	2.930e+01
3	.84	5.739e+13	6.629e-20	1.569e+01
4	.66	6.805e+15	6.916e-20	1.941e+03
5	.48	3.051e+12	7.218e-20	9.081e-01
6	.40	6.546e+11	7.019e-20	1.895e-01
7	.24	2.064e+13	6.877e-20	5.852e+00
8	.20	7.101e+11	6.671e-20	1.953e-01
9	.12	1.265e+14	5.753e-20	3.001e+01
10				
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12				
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20				
		---		---
	TOTALS:	7.258e+15		2.060e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 35M_U_B.SKY Date: __/__/__
Run: 1:07 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 35 minute unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	71.03
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	28.97
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	27.97
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 35 minute unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	3.381e+11	6.066e-20	8.455e-02
2	1.70	1.370e+12	6.031e-20	3.407e-01
3	1.48	5.509e+12	5.971e-20	1.356e+00
4	1.23	1.556e+13	6.673e-20	4.282e+00
5	1.00	2.866e+13	6.799e-20	8.035e+00
6	.82	4.074e+13	6.595e-20	1.108e+01
7	.65	1.095e+14	6.975e-20	3.149e+01
8	.47	1.755e+14	7.212e-20	5.220e+01
9	.35	2.234e+14	6.826e-20	6.289e+01
10	.25	4.365e+14	6.887e-20	1.239e+02
11	.15	1.126e+15	6.277e-20	2.915e+02
12				
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20				
TOTALS:		2.163e+15		5.872e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 40M_UN.SKY Date: ___/___/___
Run: 1:10 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 40 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	69.1
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	30.9
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	29.9
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 40 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.3048e+05	Co-60	4.3080e+02
Eu-154	9.6552e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.590e+14	6.560e-20	4.301e+01
2	1.03	1.192e+14	6.853e-20	3.369e+01
3	.84	6.559e+13	6.668e-20	1.804e+01
4	.66	7.778e+15	6.956e-20	2.231e+03
5	.48	3.487e+12	7.257e-20	1.043e+00
6	.40	7.481e+11	7.056e-20	2.177e-01
7	.24	2.359e+13	6.917e-20	6.727e+00
8	.20	8.115e+11	6.711e-20	2.246e-01
9	.12	1.446e+14	5.789e-20	3.451e+01
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11				
12				
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15				
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19				
20				
TOTALS:		8.295e+15		2.368e+03

MicroSkyshine
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(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 40M_U_B.SKY Date: __/__/__
Run: 1:13 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 40 minute unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	69.1
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	30.9
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	29.9
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....M		5
Number of Circumferential Segments.....N		5
Number of Vertical Segments.....C		5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 40 minute unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	3.864e+11	6.112e-20	9.737e-02
2	1.70	1.566e+12	6.075e-20	3.923e-01
3	1.48	6.296e+12	6.013e-20	1.561e+00
4	1.23	1.778e+13	6.717e-20	4.926e+00
5	1.00	3.275e+13	6.842e-20	9.240e+00
6	.82	4.656e+13	6.635e-20	1.274e+01
7	.65	1.251e+14	7.015e-20	3.619e+01
8	.47	2.006e+14	7.251e-20	5.998e+01
9	.35	2.554e+14	6.861e-20	7.225e+01
10	.25	4.988e+14	6.926e-20	1.424e+02
11	.15	1.287e+15	6.316e-20	3.352e+02
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20				
TOTALS:		2.472e+15		6.750e+02

MicroSkyshine
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(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 43M_UN.SKY Date: ___/___/___
Run: Input only By: _____
: Checked: _____

CASE: 43 minute unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	68.
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	32.
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	31.
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 43 minute unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.4776e+05	Co-60	4.6311e+02
Eu-154	1.0379e+04		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.709e+14	6.584e-20	4.641e+01
2	1.03	1.282e+14	6.877e-20	3.634e+01
3	.84	7.051e+13	6.690e-20	1.945e+01
4	.66	8.361e+15	6.977e-20	2.406e+03
5	.48	3.749e+12	7.278e-20	1.125e+00
6	.40	8.042e+11	7.076e-20	2.347e-01
7	.24	2.535e+13	6.939e-20	7.255e+00
8	.20	8.724e+11	6.733e-20	2.422e-01
9	.12	1.554e+14	5.810e-20	3.723e+01
10				
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12				
13				
14				
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18				
19				
20				
TOTALS:		8.917e+15		2.554e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 43M_U_B.SKY Date: __/__/__
Run: Input only By: _____
: Checked: _____

CASE: 43minute 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	68.
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	32.
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	31.
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 43minute 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	4.153e+11	6.137e-20	1.051e-01
2	1.70	1.683e+12	6.099e-20	4.234e-01
3	1.48	6.768e+12	6.036e-20	1.685e+00
4	1.23	1.912e+13	6.741e-20	5.314e+00
5	1.00	3.521e+13	6.865e-20	9.966e+00
6	.82	5.005e+13	6.656e-20	1.374e+01
7	.65	1.345e+14	7.036e-20	3.902e+01
8	.47	2.156e+14	7.272e-20	6.467e+01
9	.35	2.745e+14	6.881e-20	7.789e+01
10	.25	5.362e+14	6.948e-20	1.536e+02
11	.15	1.384e+15	6.338e-20	3.616e+02
12				
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18				
19				
20				
		---		---
	TOTALS:	2.658e+15		7.281e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 1H_UNMIT.SKY
Run: Input only
:

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 1 hour unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	62.38
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	37.62
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	36.62
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 1 hour unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	3.4571e+05	Co-60	6.4620e+02
Eu-154	1.4483e+04		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	2.385e+14	6.697e-20	6.586e+01
2	1.03	1.788e+14	6.988e-20	5.153e+01
3	.84	9.839e+13	6.794e-20	2.756e+01
4	.66	1.167e+16	7.082e-20	3.407e+03
5	.48	5.231e+12	7.384e-20	1.593e+00
6	.40	1.122e+12	7.178e-20	3.322e-01
7	.24	3.538e+13	7.055e-20	1.029e+01
8	.20	1.217e+12	6.853e-20	3.440e-01
9	.12	2.168e+14	5.920e-20	5.293e+01
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		1.244e+16		3.618e+03

MicroSkyshine
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(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 1H_U_B.SKY Date: __/__/__
Run: Input only By: _____
: Checked: _____

CASE: 1 hour unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	62.38
Depth of source behind wall.....	Y	1.056
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.444
Distance between center of source and wall...	R1	37.62
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	36.62
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 1 hour unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	5.795e+11	6.201e-20	1.482e-01
2	1.70	2.349e+12	6.163e-20	5.969e-01
3	1.48	9.444e+12	6.098e-20	2.375e+00
4	1.23	2.668e+13	6.809e-20	7.489e+00
5	1.00	4.913e+13	6.933e-20	1.404e+01
6	.82	6.984e+13	6.722e-20	1.936e+01
7	.65	1.877e+14	7.108e-20	5.501e+01
8	.47	3.009e+14	7.349e-20	9.118e+01
9	.35	3.830e+14	6.954e-20	1.098e+02
10	.25	7.482e+14	7.042e-20	2.172e+02
11	.15	1.931e+15	6.439e-20	5.126e+02
12				
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14				
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20				
		---		---
	TOTALS:	3.709e+15		1.030e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 2H_UN.SKY
Run: 11:23 a.m.
: July 3, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 2 hour unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	47.2
Depth of source behind wall.....	Y	1.056
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.444
Distance between center of source and wall...	R1	52.8
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	51.8
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 2 hour unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	6.9143e+05	Co-60	1.2924e+03
Eu-154	2.8966e+04		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	4.770e+14	6.933e-20	1.364e+02
2	1.03	3.577e+14	7.227e-20	1.066e+02
3	.84	1.968e+14	7.024e-20	5.699e+01
4	.66	2.333e+16	7.325e-20	7.048e+03
5	.48	1.046e+13	7.644e-20	3.297e+00
6	.40	2.244e+12	7.432e-20	6.878e-01
7	.24	7.076e+13	7.375e-20	2.152e+01
8	.20	2.435e+12	7.192e-20	7.220e-01
9	.12	4.337e+14	6.242e-20	1.116e+02
10				
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18				
19				
20				
TOTALS:		2.488e+16		7.486e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 2H_U_B.SKY
Run: 11:29 a.m.
: July 3, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 2 hour unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	47.2
Depth of source behind wall.....	Y	1.156
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.344
Distance between center of source and wall...	R1	52.8
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	51.8
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 2 hour unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	1.159e+12	6.449e-20	3.082e-01
2	1.70	4.698e+12	6.405e-20	1.241e+00
3	1.48	1.889e+13	6.333e-20	4.933e+00
4	1.23	5.335e+13	7.063e-20	1.554e+01
5	1.00	9.826e+13	7.185e-20	2.911e+01
6	.82	1.397e+14	6.962e-20	4.011e+01
7	.65	3.754e+14	7.364e-20	1.140e+02
8	.47	6.018e+14	7.618e-20	1.890e+02
9	.35	7.661e+14	7.210e-20	2.277e+02
10	.25	1.496e+15	7.364e-20	4.543e+02
11	.15	3.862e+15	6.784e-20	1.080e+03
12				
13				
14				
15				
16				
17				
18				
19				
20				
	TOTALS:	7.417e+15		2.157e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 3H_UN.SKY
Run: 11:35 a.m.
: July 3, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 3 hour unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	35.56
Depth of source behind wall.....	Y	1.256
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.244
Distance between center of source and wall...	R1	64.44
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	63.44
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 3 hour unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.0371e+06	Co-60	1.9386e+03
Eu-154	2.4138e+02		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.33	7.531e+13	6.986e-20	2.169e+01
2	1.17	7.431e+13	7.309e-20	2.240e+01
3	.84	1.640e+12	7.165e-20	4.845e-01
4	.66	3.453e+16	7.484e-20	1.066e+04
5	.48	8.718e+10	7.820e-20	2.811e-02
6	.40	1.870e+10	7.606e-20	5.866e-03
7	.24	5.896e+11	7.616e-20	1.852e-01
8	.20	2.029e+10	7.452e-20	6.234e-03
9	.12	3.614e+12	6.497e-20	9.681e-01
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		3.469e+16		1.070e+04

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 3H_U_B.SKY
Run: 1:03 p.m.
: July 3, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 3 hour unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	35.56
Depth of source behind wall.....	Y	1.256
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.244
Distance between center of source and wall...	R1	64.44
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	63.44
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 3 hour unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	1.739e+12	6.612e-20	4.741e-01
2	1.70	7.047e+12	6.565e-20	1.908e+00
3	1.48	2.826e+13	6.489e-20	7.561e+00
4	1.23	8.003e+13	7.234e-20	2.387e+01
5	1.00	1.474e+14	7.358e-20	4.472e+01
6	.82	2.095e+14	7.128e-20	6.158e+01
7	.65	5.630e+14	7.546e-20	1.752e+02
8	.47	9.027e+14	7.814e-20	2.908e+02
9	.35	1.149e+15	7.398e-20	3.505e+02
10	.25	2.245e+15	7.614e-20	7.048e+02
11	.15	5.792e+15	7.059e-20	1.686e+03
12				
13				
14				
15				
16				
17				
18				
19				
20				
		---		---
	TOTALS:	1.113e+16		3.347e+03

MicroSkyshine
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(Safety Analysis and Risk Assessment - 1:16-007)

Page: 1 File Ref: _____
File: 4H_UNMT.SKY Date: __/__/__
Run: 1:09 p.m. By: _____
: July 3, 1997 Checked: _____

CASE: 4 hour unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	25.75
Depth of source behind wall.....	Y	1.5
Offset of detector.....	Z	0.
Depth of dose point.....	H	0.
Distance between center of source and wall...	R1	74.25
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	73.25
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 4 hour unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.3829e+06	Co-60	2.5840e+03
Eu-154	5.7931e+04		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	9.540e+14	7.157e-20	2.816e+02
2	1.03	7.153e+14	7.466e-20	2.202e+02
3	.84	3.936e+14	7.257e-20	1.178e+02
4	.66	4.667e+16	7.586e-20	1.460e+04
5	.48	2.092e+13	7.939e-20	6.849e+00
6	.40	4.489e+12	7.725e-20	1.430e+00
7	.24	1.415e+14	7.789e-20	4.545e+01
8	.20	4.869e+12	7.641e-20	1.534e+00
9	.12	8.673e+14	6.685e-20	2.391e+02
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		4.977e+16		1.551e+04

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 5H_UN.SKY
Run: 1:20 p.m.
: July 3, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 5 hour unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	17.1
Depth of source behind wall.....	Y	1.5
Offset of detector.....	Z	0.
Depth of dose point.....	H	0.
Distance between center of source and wall...	R1	82.9
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	81.9
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 5 hour unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.7286e+06	Co-60	3.2310e+03
Eu-154	7.2414e+04		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.193e+15	7.258e-20	3.569e+02
2	1.03	8.942e+14	7.564e-20	2.789e+02
3	.84	4.920e+14	7.349e-20	1.491e+02
4	.66	5.833e+16	7.680e-20	1.847e+04
5	.48	2.615e+13	8.037e-20	8.667e+00
6	.40	5.611e+12	7.820e-20	1.809e+00
7	.24	1.769e+14	7.918e-20	5.776e+01
8	.20	6.087e+12	7.782e-20	1.953e+00
9	.12	1.084e+15	6.821e-20	3.049e+02
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	TOTALS:	6.221e+16		1.963e+04

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 5H_U_B.SKY
Run: 1:26 p.m.
: July 3, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 5 hour unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	17.1
Depth of source behind wall.....	Y	1.5
Offset of detector.....	Z	0.
Depth of dose point.....	H	0.
Distance between center of source and wall...	R1	82.9
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	81.
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 5 hour unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	2.898e+12	6.801e-20	8.127e-01
2	1.70	1.174e+13	6.748e-20	3.267e+00
3	1.48	4.722e+13	6.666e-20	1.298e+01
4	1.23	1.334e+14	7.427e-20	4.085e+01
5	1.00	2.456e+14	7.549e-20	7.645e+01
6	.82	3.492e+14	7.311e-20	1.053e+02
7	.65	9.384e+14	7.746e-20	2.997e+02
8	.47	1.505e+15	8.029e-20	4.983e+02
9	.35	1.915e+15	7.605e-20	6.005e+02
10	.25	3.741e+15	7.903e-20	1.219e+03
11	.15	9.654e+15	7.388e-20	2.941e+03
12				
13				
14				
15				
16				
17				
18				
19				
20				
	TOTALS:	1.854e+16		5.798e+03

MicroSkyshine
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(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 6H_UN.SKY
Run: 1:32 p.m.
: July 3, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 6 hour unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	9.29
Depth of source behind wall.....	Y	1.5
Offset of detector.....	Z	0.
Depth of dose point.....	H	0.
Distance between center of source and wall...	R1	90.71
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	89.71
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....M		5
Number of Circumferential Segments.....N		5
Number of Vertical Segments.....C		5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 6 hour unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.0743e+06	Co-60	3.8772e+03
Eu-154	8.6897e+04		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.431e+15	7.298e-20	4.306e+02
2	1.03	1.073e+15	7.601e-20	3.363e+02
3	.84	5.903e+14	7.382e-20	1.797e+02
4	.66	7.000e+16	7.714e-20	2.226e+04
5	.48	3.138e+13	8.072e-20	1.045e+01
6	.40	6.733e+12	7.854e-20	2.181e+00
7	.24	2.123e+14	7.975e-20	6.981e+01
8	.20	7.304e+12	7.846e-20	2.363e+00
9	.12	1.301e+15	6.887e-20	3.695e+02
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		7.465e+16		2.367e+04

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 7H_UNMIT.SKY Date: __/__/__
Run: 1:44 p.m. By: _____
: July 3, 1997 Checked: _____

CASE: 7 hour unmitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	3.1
Depth of source behind wall.....	Y	1.5
Offset of detector.....	Z	0.
Depth of dose point.....	H	0.
Distance between center of source and wall...	R1	96.9
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	96.9
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 7 hour unmitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.4200e+06	Co-60	4.5234e+03
Eu-154	1.0138e+05		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.670e+15	7.282e-20	5.014e+02
2	1.03	1.252e+15	7.582e-20	3.914e+02
3	.84	6.887e+14	7.362e-20	2.091e+02
4	.66	8.167e+16	7.692e-20	2.590e+04
5	.48	3.661e+13	8.049e-20	1.215e+01
6	.40	7.855e+12	7.832e-20	2.537e+00
7	.24	2.476e+14	7.967e-20	8.136e+01
8	.20	8.521e+12	7.844e-20	2.756e+00
9	.12	1.518e+15	6.891e-20	4.313e+02
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	TOTALS:	8.709e+16		2.754e+04

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 7H_U_B.SKY Date: __/__/__
Run: 1:59 p.m. By: _____
: July 3, 1997 Checked: _____

CASE: 7 hour unmitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	2.1
Depth of source behind wall.....	Y	1.5
Offset of detector.....	Z	0.
Depth of dose point.....	H	0.
Distance between center of source and wall...	R1	97.9
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	96.9
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 7 hour unmitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	4.057e+12	6.841e-20	1.144e+00
2	1.70	1.644e+13	6.785e-20	4.600e+00
3	1.48	6.611e+13	6.697e-20	1.826e+01
4	1.23	1.867e+14	7.453e-20	5.739e+01
5	1.00	3.439e+14	7.570e-20	1.073e+02
6	.82	4.889e+14	7.327e-20	1.477e+02
7	.65	1.314e+15	7.763e-20	4.205e+02
8	.47	2.106e+15	8.046e-20	6.988e+02
9	.35	2.681e+15	7.620e-20	8.425e+02
10	.25	5.237e+15	7.958e-20	1.719e+03
11	.15	1.352e+16	7.468e-20	4.162e+03
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		2.596e+16		8.179e+03

ATTACHMENT 3: MITIGATED ACCIDENT MICROSHIELD RUNS

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 1M_MIT.MS4 Date: __/__/__
Run Date: April 4, 1997 By: _____
Run Time: 9:30 a.m. Friday Checked: _____
Duration: 0:00:27

Case Title: 1min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	473.0	15.0	6.2
Side Clad:	9527.0	312.0	6.8

Source Volume: 2.46003e+6 cm^3 86.8751 cu ft. 150120. cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	5.5110e+003	2.2402e+003	Co-60	9.4474e+000	3.8403e+000
Eu-154	1.4909e+002	6.0605e+001			

Page : 2
DOS File: 1M_MIT.MS4
Run Date: April 4, 1997
Run Time: 9:30 a.m. Friday
Title : 1min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0446	1.848e+013	6.496e-001	9.162e+000	2.202e-003	3.106e-002
0.246	3.767e+011	4.430e-001	4.586e+000	8.150e-004	8.436e-003
0.4426	5.130e+010	1.792e-001	1.091e+000	3.510e-004	2.136e-003
0.5907	3.438e+011	2.055e+000	9.955e+000	4.015e-003	1.945e-002
0.6622	1.850e+014	1.368e+003	6.091e+003	2.653e+000	1.181e+001
0.8723	7.740e+011	9.576e+000	3.530e+001	1.802e-002	6.643e-002
1.0024	1.568e+012	2.515e+001	8.510e+001	4.634e-002	1.568e-001
1.2574	2.391e+012	5.854e+001	1.740e+002	1.030e-001	3.061e-001
1.3325	3.496e+011	9.534e+000	2.748e+001	1.654e-002	4.767e-002
1.5767	1.944e+011	7.245e+000	1.921e+001	1.202e-002	3.187e-002
TOTAL:	2.095e+014	1.482e+003	6.457e+003	2.856e+000	1.248e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 1M_M_B.MS4 Date: __/__/__
Run Date: April 4, 1997 By: _____
Run Time: 9:52 a.m. Friday Checked: _____
Duration: 0:01:01

Case Title: 1min mitigated 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	473.0	15.0	6.2
Side Clad:	9527.0	312.0	6.8

Source Volume: 2.46003e+6 cm^3 86.8751 cu ft. 150120. cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 1M_M_B.MS4
Run Date: April 4, 1997
Run Time: 9:52 a.m. Friday
Title : 1min mitigated 67/33 betas

========== RESULTS ==========

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	4.741e+013	2.290e-010	3.984e-010	1.964e-011	3.417e-011
0.025	2.393e+013	9.838e-003	3.850e-002	1.697e-004	6.641e-004
0.035	1.525e+013	1.704e-001	1.405e+000	1.079e-003	8.903e-003
0.045	1.082e+013	3.919e-001	5.621e+000	1.303e-003	1.869e-002
0.055	8.182e+012	5.459e-001	1.088e+001	1.229e-003	2.449e-002
0.065	6.461e+012	6.428e-001	1.505e+001	1.167e-003	2.733e-002
0.075	5.238e+012	7.028e-001	1.736e+001	1.145e-003	2.829e-002
0.085	4.358e+012	7.453e-001	1.831e+001	1.158e-003	2.844e-002
0.095	3.674e+012	7.728e-001	1.828e+001	1.183e-003	2.798e-002
0.15	1.923e+013	9.228e+000	1.542e+002	1.520e-002	2.539e-001
0.25	7.455e+012	9.034e+000	9.207e+001	1.667e-002	1.699e-001
0.35	3.816e+012	8.617e+000	6.415e+001	1.662e-002	1.237e-001
0.475	2.997e+012	1.194e+001	6.859e+001	2.343e-002	1.346e-001
0.65	1.870e+012	1.336e+001	6.027e+001	2.593e-002	1.170e-001
0.825	6.958e+011	7.759e+000	2.965e+001	1.470e-002	5.619e-002
1.0	4.894e+011	7.814e+000	2.648e+001	1.440e-002	4.881e-002
1.225	2.657e+011	6.197e+000	1.868e+001	1.097e-002	3.307e-002
1.475	9.176e+010	3.022e+000	8.273e+000	5.108e-003	1.398e-002
1.7	2.340e+010	1.002e+000	2.566e+000	1.627e-003	4.168e-003
1.9	5.773e+009	3.031e-001	7.398e-001	4.763e-004	1.162e-003
2.1	6.079e+008	3.832e-002	8.972e-002	5.836e-005	1.366e-004
2.3	3.254e+006	2.420e-004	5.461e-004	3.579e-007	8.077e-007
TOTAL:	1.623e+014	8.229e+001	6.127e+002	1.536e-001	1.121e+000

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 2M_MIT.MS4 Date: __/__/__
Run Date: July 3, 1997 By: _____
Run Time: 4:43 p.m. Thursday Checked: _____
Duration: 0:00:27

Case Title: 2 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	669.0	21.0	11.4
Side Clad:	9331.0	306.0	1.6

Source Volume: 4.92119e+6 cm^3 173.79 cu ft. 300309. cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	µCi/cm^3	Nuclide	curies	µCi/cm^3
Ba-137m	1.1024e+004	2.2401e+003	Co-60	1.8899e+001	3.8403e+000
Eu-154	2.9825e+002	6.0605e+001			

Page : 2
DOS File: 2M_MIT.MS4
Run Date: July 3, 1997
Run Time: 4:43 p.m. Thursday
Title : 2 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0446	3.698e+013	1.308e+000	1.840e+001	4.441e-003	6.245e-002
0.246	7.536e+011	8.908e-001	9.207e+000	1.639e-003	1.694e-002
0.4426	1.026e+011	3.602e-001	2.189e+000	7.054e-004	4.287e-003
0.5907	6.878e+011	4.129e+000	1.998e+001	8.067e-003	3.904e-002
0.6622	3.701e+014	2.749e+003	1.223e+004	5.329e+000	2.370e+001
0.8723	1.548e+012	1.923e+001	7.085e+001	3.619e-002	1.333e-001
1.0024	3.137e+012	5.051e+001	1.708e+002	9.306e-002	3.147e-001
1.2574	4.783e+012	1.176e+002	3.492e+002	2.068e-001	6.144e-001
1.3325	6.993e+011	1.914e+001	5.515e+001	3.321e-002	9.568e-002
1.5767	3.890e+011	1.455e+001	3.855e+001	2.414e-002	6.397e-002
TOTAL:	4.191e+014	2.976e+003	1.296e+004	5.737e+000	2.505e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 5M_MIT.MS4 Date: ___/___/___
Run Date: July 3, 1997 By: _____
Run Time: 4:01 p.m. Thursday Checked: _____
Duration: 0:00:27

Case Title: 5 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1057.0	34.0	8.1
Side Clad:	8943.0	293.0	4.9

Source Volume: 1.22848e+7 cm^3 433.833 cu ft. 749664. cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	µCi/cm^3	Nuclide	curies	µCi/cm^3
Ba-137m	2.7520e+004	2.2402e+003	Co-60	4.7178e+001	3.8403e+000
Eu-154	7.4453e+002	6.0605e+001			

Page : 2
DOS File: 5M_MIT.MS4
Run Date: July 3, 1997
Run Time: 4:01 p.m. Thursday
Title : 5 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1	1.115e+013	2.641e+000	6.036e+001	4.040e-003	9.234e-002
0.2	1.881e+012	1.549e+000	1.945e+001	2.734e-003	3.433e-002
0.4	1.965e+011	5.794e-001	3.819e+000	1.129e-003	7.441e-003
0.5	5.965e+010	2.660e-001	1.460e+000	5.221e-004	2.866e-003
0.6	9.184e+014	5.748e+003	2.742e+004	1.122e+001	5.352e+001
0.8	1.074e+013	1.149e+002	4.468e+002	2.186e-001	8.499e-001
1.0	1.022e+013	1.657e+002	5.602e+002	3.055e-001	1.033e+000
1.5	1.249e+013	4.307e+002	1.167e+003	7.247e-001	1.964e+000
TOTAL:	9.652e+014	6.465e+003	2.968e+004	1.248e+001	5.750e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 7M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:40 a.m. Sunday
Duration: 0:00:27

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 7 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1251.0	41.0	.5
Side Clad:	8749.0	287.0	.5

Source Volume: 1.72081e+7 cm^3 607.698 cu ft. 1.0501e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	3.8550e+004	2.2402e+003	Co-60	6.6085e+001	3.8403e+000
Eu-154	1.0429e+003	6.0605e+001			

Page : 2
DOS File: 7M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:40 a.m. Sunday
Title : 7 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1146	1.761e+013	5.405e+000	1.125e+002	8.379e-003	1.744e-001
0.246	2.635e+012	3.195e+000	3.275e+001	5.878e-003	6.026e-002
0.4426	3.589e+011	1.288e+000	7.784e+000	2.522e-003	1.524e-002
0.5907	2.405e+012	1.475e+001	7.103e+001	2.881e-002	1.388e-001
0.6622	1.294e+015	9.813e+003	4.345e+004	1.902e+001	8.423e+001
0.8723	5.414e+012	6.859e+001	2.518e+002	1.291e-001	4.738e-001
1.0024	1.097e+013	1.800e+002	6.069e+002	3.317e-001	1.118e+000
1.2574	1.673e+013	4.187e+002	1.241e+003	7.366e-001	2.183e+000
1.3325	2.445e+012	6.818e+001	1.959e+002	1.183e-001	3.399e-001
1.5767	1.360e+012	5.178e+001	1.369e+002	8.593e-002	2.272e-001
TOTAL:	1.354e+015	1.062e+004	4.611e+004	2.047e+001	8.896e+001

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 10M_MIT.MS4 Date: __/__/__
Run Date: April 6, 1997 By: _____
Run Time: 10:35 a.m. Sunday Checked: _____
Duration: 0:00:27

Case Title: 10 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1495.0	49.0	.6
Side Clad:	8505.0	279.0	.4

Source Volume: 2.45754e+7 cm^3 867.871 cu ft. 1.49968e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	5.5054e+004	2.2402e+003	Co-60	9.4378e+001	3.8403e+000
Eu-154	1.4894e+003	6.0605e+001			

Page : 2
DOS File: 10M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:35 a.m. Sunday
Title : 10 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1146	2.515e+013	7.857e+000	1.625e+002	1.218e-002	2.519e-001
0.246	3.763e+012	4.632e+000	4.726e+001	8.522e-003	8.694e-002
0.4426	5.125e+011	1.864e+000	1.123e+001	3.651e-003	2.199e-002
0.5907	3.435e+012	2.133e+001	1.024e+002	4.167e-002	2.001e-001
0.6622	1.848e+015	1.419e+004	6.266e+004	2.751e+001	1.215e+002
0.8723	7.732e+012	9.911e+001	3.630e+002	1.865e-001	6.831e-001
1.0024	1.567e+013	2.601e+002	8.751e+002	4.792e-001	1.612e+000
1.2574	2.389e+013	6.046e+002	1.789e+003	1.064e+000	3.147e+000
1.3325	3.492e+012	9.843e+001	2.824e+002	1.708e-001	4.900e-001
1.5767	1.942e+012	7.473e+001	1.974e+002	1.240e-001	3.275e-001
TOTAL:	1.934e+015	1.536e+004	6.649e+004	2.960e+001	1.283e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 12M_MIT.MS4 Date: ___/___/___
Run Date: April 6, 1997 By: _____
Run Time: 10:36 a.m. Sunday Checked: _____
Duration: 0:00:27

Case Title: 12 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1638.0	53.0	8.9
Side Clad:	8362.0	274.0	4.1

Source Volume: 2.95016e+7 cm^3 1041.84 cu ft. 1.8003e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	6.6090e+004	2.2402e+003	Co-60	1.1330e+002	3.8403e+000
Eu-154	1.7880e+003	6.0605e+001			

Page : 2
DOS File: 12M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:36 a.m. Sunday
Title : 12 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1146	3.019e+013	9.545e+000	1.965e+002	1.480e-002	3.046e-001
0.246	4.518e+012	5.618e+000	5.713e+001	1.033e-002	1.051e-001
0.4426	6.152e+011	2.258e+000	1.357e+001	4.422e-003	2.657e-002
0.5907	4.123e+012	2.582e+001	1.238e+002	5.045e-002	2.418e-001
0.6622	2.219e+015	1.718e+004	7.571e+004	3.329e+001	1.468e+002
0.8723	9.282e+012	1.199e+002	4.386e+002	2.256e-001	8.253e-001
1.0024	1.881e+013	3.146e+002	1.057e+003	5.797e-001	1.948e+000
1.2574	2.867e+013	7.312e+002	2.161e+003	1.286e+000	3.802e+000
1.3325	4.192e+012	1.190e+002	3.412e+002	2.065e-001	5.920e-001
1.5767	2.332e+012	9.035e+001	2.384e+002	1.500e-001	3.957e-001
TOTAL:	2.321e+015	1.859e+004	8.034e+004	3.582e+001	1.550e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 15M_MIT.MS4 Date: ___/___/___
Run Date: April 6, 1997 By: _____
Run Time: 10:36 a.m. Sunday Checked: _____
Duration: 0:00:27

Case Title: 15 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1831.0	60.0	.9
Side Clad:	8169.0	268.0	.1

Source Volume: 3.68633e+7 cm^3 1301.82 cu ft. 2.24954e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	8.2581e+004	2.2402e+003	Co-60	1.4157e+002	3.8403e+000
Eu-154	2.2341e+003	6.0605e+001			

Page : 2
DOS File: 15M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:36 a.m. Sunday
Title : 15 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1146	3.772e+013	1.214e+001	2.483e+002	1.882e-002	3.849e-001
0.246	5.645e+012	7.127e+000	7.213e+001	1.311e-002	1.327e-001
0.4426	7.687e+011	2.860e+000	1.712e+001	5.601e-003	3.353e-002
0.5907	5.152e+012	3.268e+001	1.562e+002	6.385e-002	3.051e-001
0.6622	2.772e+015	2.173e+004	9.553e+004	4.212e+001	1.852e+002
0.8723	1.160e+013	1.516e+002	5.534e+002	2.853e-001	1.041e+000
1.0024	2.350e+013	3.977e+002	1.334e+003	7.328e-001	2.458e+000
1.2574	3.583e+013	9.238e+002	2.726e+003	1.625e+000	4.796e+000
1.3325	5.238e+012	1.504e+002	4.304e+002	2.609e-001	7.467e-001
1.5767	2.914e+012	1.141e+002	3.007e+002	1.894e-001	4.991e-001
TOTAL:	2.901e+015	2.352e+004	1.014e+005	4.532e+001	1.956e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 17M_MIT.MS4 Date: ___/___/___
Run Date: April 6, 1997 By: _____
Run Time: 10:37 a.m. Sunday Checked: _____
Duration: 0:00:27

Case Title: 17 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	1950.0	63.0	11.7
Side Clad:	8050.0	264.0	1.3

Source Volume: 4.18107e+7 cm^3 1476.53 cu ft. 2.55144e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	µCi/cm^3	Nuclide	curies	µCi/cm^3
Ba-137m	9.3664e+004	2.2402e+003	Co-60	1.6057e+002	3.8403e+000
Eu-154	2.5340e+003	6.0605e+001			

Page : 2
DOS File: 17M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:37 a.m. Sunday
Title : 17 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1146	4.278e+013	1.394e+001	2.837e+002	2.160e-002	4.398e-001
0.246	6.403e+012	8.167e+000	8.238e+001	1.503e-002	1.515e-001
0.4426	8.719e+011	3.274e+000	1.955e+001	6.411e-003	3.829e-002
0.5907	5.844e+012	3.739e+001	1.783e+002	7.304e-002	3.484e-001
0.6622	3.144e+015	2.486e+004	1.091e+005	4.818e+001	2.114e+002
0.8723	1.315e+013	1.734e+002	6.318e+002	3.262e-001	1.189e+000
1.0024	2.665e+013	4.546e+002	1.523e+003	8.376e-001	2.806e+000
1.2574	4.064e+013	1.056e+003	3.112e+003	1.857e+000	5.475e+000
1.3325	5.941e+012	1.718e+002	4.913e+002	2.981e-001	8.524e-001
1.5767	3.305e+012	1.304e+002	3.433e+002	2.164e-001	5.697e-001
TOTAL:	3.290e+015	2.690e+004	1.157e+005	5.183e+001	2.233e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 20M_MIT.MS4 Date: ___/___/___
Run Date: April 6, 1997 By: _____
Run Time: 10:37 a.m. Sunday Checked: _____
Duration: 0:00:27

Case Title: 20 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2115.0	69.0	4.7
Side Clad:	7885.0	258.0	8.3

Source Volume: 4.91857e+7 cm^3 1736.98 cu ft. 3.00149e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	µCi/cm^3	Nuclide	curies	µCi/cm^3
Ba-137m	1.1019e+005	2.2402e+003	Co-60	1.8889e+002	3.8403e+000
Eu-154	2.9809e+003	6.0605e+001			

Page : 2
DOS File: 20M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:37 a.m. Sunday
Title : 20 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1146	5.033e+013	1.669e+001	3.376e+002	2.587e-002	5.233e-001
0.246	7.532e+012	9.757e+000	9.793e+001	1.795e-002	1.802e-001
0.4426	1.026e+012	3.904e+000	2.324e+001	7.645e-003	4.550e-002
0.5907	6.875e+012	4.455e+001	2.119e+002	8.704e-002	4.140e-001
0.6622	3.699e+015	2.961e+004	1.296e+005	5.740e+001	2.512e+002
0.8723	1.548e+013	2.064e+002	7.506e+002	3.884e-001	1.412e+000
1.0024	3.135e+013	5.410e+002	1.809e+003	9.969e-001	3.333e+000
1.2574	4.781e+013	1.256e+003	3.696e+003	2.210e+000	6.503e+000
1.3325	6.989e+012	2.044e+002	5.836e+002	3.546e-001	1.012e+000
1.5767	3.887e+012	1.550e+002	4.076e+002	2.573e-001	6.765e-001
TOTAL:	3.870e+015	3.205e+004	1.375e+005	6.174e+001	2.653e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 25M_MIT.MS4 Date: ___/___/___
Run Date: April 6, 1997 By: _____
Run Time: 10:38 a.m. Sunday Checked: _____
Duration: 0:00:27

Case Title: 25 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2364.0	77.0	6.7
Side Clad:	7636.0	250.0	6.3

Source Volume: 6.14487e+7 cm^3 2170.04 cu ft. 3.74983e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	1.3766e+005	2.2402e+003	Co-60	2.3598e+002	3.8403e+000
Eu-154	3.7241e+003	6.0605e+001			

Page : 2
DOS File: 25M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:38 a.m. Sunday
Title : 25 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1146	6.288e+013	2.148e+001	4.297e+002	3.331e-002	6.662e-001
0.246	9.410e+012	1.251e+001	1.245e+002	2.301e-002	2.290e-001
0.4426	1.281e+012	4.989e+000	2.952e+001	9.771e-003	5.782e-002
0.5907	8.588e+012	5.687e+001	2.692e+002	1.111e-001	5.258e-001
0.6622	4.621e+015	3.778e+004	1.646e+005	7.323e+001	3.190e+002
0.8723	1.933e+013	2.631e+002	9.532e+002	4.950e-001	1.793e+000
1.0024	3.917e+013	6.892e+002	2.297e+003	1.270e+000	4.232e+000
1.2574	5.972e+013	1.599e+003	4.693e+003	2.813e+000	8.256e+000
1.3325	8.731e+012	2.602e+002	7.408e+002	4.514e-001	1.285e+000
1.5767	4.857e+012	1.972e+002	5.174e+002	3.273e-001	8.587e-001
TOTAL:	4.835e+015	4.088e+004	1.746e+005	7.877e+001	3.369e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 30M_MIT.MS4 Date: ___/___/___
Run Date: April 6, 1997 By: _____
Run Time: 10:38 a.m. Sunday Checked: _____
Duration: 0:00:27

Case Title: 30 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2590.0	84.0	11.7
Side Clad:	7410.0	243.0	1.3

Source Volume: 7.37594e+7 cm^3 2604.79 cu ft. 4.50108e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	1.6524e+005	2.2402e+003	Co-60	2.8326e+002	3.8403e+000
Eu-154	4.4702e+003	6.0605e+001			

Page : 2
DOS File: 30M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:38 a.m. Sunday
Title : 30 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1146	7.548e+013	2.658e+001	5.257e+002	4.120e-002	8.150e-001
0.246	1.130e+013	1.540e+001	1.521e+002	2.834e-002	2.798e-001
0.4426	1.538e+012	6.128e+000	3.605e+001	1.200e-002	7.060e-002
0.5907	1.031e+013	6.977e+001	3.286e+002	1.363e-001	6.419e-001
0.6622	5.547e+015	4.632e+004	2.009e+005	8.980e+001	3.894e+002
0.8723	2.321e+013	3.222e+002	1.163e+003	6.063e-001	2.189e+000
1.0024	4.702e+013	8.438e+002	2.803e+003	1.555e+000	5.164e+000
1.2574	7.169e+013	1.956e+003	5.726e+003	3.441e+000	1.007e+001
1.3325	1.048e+013	3.182e+002	9.038e+002	5.521e-001	1.568e+000
1.5767	5.830e+012	2.411e+002	6.312e+002	4.002e-001	1.047e+000
TOTAL:	5.804e+015	5.012e+004	2.132e+005	9.657e+001	4.113e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1
DOS File: 35M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:39 a.m. Sunday
Duration: 0:00:27

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

Case Title: 35 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet	and inches
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2797.0	91.0	9.2
Side Clad:	7203.0	236.0	3.8

Source Volume: 8.60207e+7 cm^3 3037.79 cu ft. 5.2493e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	1.9270e+005	2.2402e+003	Co-60	3.3035e+002	3.8403e+000
Eu-154	5.2133e+003	6.0605e+001			

Page : 2
DOS File: 35M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:39 a.m. Sunday
Title : 35 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1146	8.802e+013	3.194e+001	6.249e+002	4.952e-002	9.688e-001
0.246	1.317e+013	1.844e+001	1.806e+002	3.392e-002	3.322e-001
0.4426	1.794e+012	7.314e+000	4.277e+001	1.432e-002	8.377e-002
0.5907	1.202e+013	8.316e+001	3.898e+002	1.625e-001	7.614e-001
0.6622	6.469e+015	5.519e+004	2.383e+005	1.070e+002	4.619e+002
0.8723	2.706e+013	3.835e+002	1.379e+003	7.216e-001	2.596e+000
1.0024	5.484e+013	1.004e+003	3.323e+003	1.850e+000	6.124e+000
1.2574	8.361e+013	2.325e+003	6.788e+003	4.090e+000	1.194e+001
1.3325	1.222e+013	3.782e+002	1.071e+003	6.561e-001	1.859e+000
1.5767	6.799e+012	2.864e+002	7.481e+002	4.754e-001	1.242e+000
TOTAL:	6.768e+015	5.971e+004	2.528e+005	1.150e+002	4.878e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 40M_MIT.MS4 Date: __/__/__
Run Date: April 6, 1997 By: _____
Run Time: 10:39 a.m. Sunday Checked: _____
Duration: 0:00:27

Case Title: 40 min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	2990.0	98.0	1.2
Side Clad:	7010.0	229.0	11.8

Source Volume: 9.83015e+7 cm^3 3471.49 cu ft. 5.99873e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	2.2021e+005	2.2402e+003	Co-60	3.7751e+002	3.8403e+000
Eu-154	5.9576e+003	6.0605e+001			

Page : 2
DOS File: 40M_MIT.MS4
Run Date: April 6, 1997
Run Time: 10:39 a.m. Sunday
Title : 40 min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.1146	1.006e+014	3.762e+001	7.281e+002	5.833e-002	1.129e+000
0.246	1.505e+013	2.163e+001	2.101e+002	3.979e-002	3.865e-001
0.4426	2.050e+012	8.555e+000	4.974e+001	1.675e-002	9.741e-002
0.5907	1.374e+013	9.715e+001	4.531e+002	1.898e-001	8.852e-001
0.6622	7.392e+015	6.445e+004	2.769e+005	1.249e+002	5.369e+002
0.8723	3.093e+013	4.473e+002	1.603e+003	8.417e-001	3.017e+000
1.0024	6.266e+013	1.170e+003	3.862e+003	2.156e+000	7.116e+000
1.2574	9.554e+013	2.709e+003	7.887e+003	4.765e+000	1.388e+001
1.3325	1.397e+013	4.405e+002	1.245e+003	7.643e-001	2.160e+000
1.5767	7.769e+012	3.335e+002	8.690e+002	5.534e-001	1.442e+000
TOTAL:	7.735e+015	6.971e+004	2.939e+005	1.343e+002	5.670e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 43M_MIT.MS4 Date: ___/___/___
Run Date: April 4, 1997 By: _____
Run Time: 10:28 a.m. Friday Checked: _____
Duration: 0:00:27

Case Title: 43min mitigated 67/33 gammas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	3100.0	101.0	8.5
Side Clad:	6900.0	226.0	4.5

Source Volume: 1.05667e+8 cm^3 3731.61 cu ft. 6.44822e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE NUCLIDES

Nuclide	curies	μCi/cm^3	Nuclide	curies	μCi/cm^3
Ba-137m	2.3672e+005	2.2402e+003	Co-60	4.0580e+002	3.8403e+000
Eu-154	6.4040e+003	6.0605e+001			

Page : 2
DOS File: 43M_MIT.MS4
Run Date: April 4, 1997
Run Time: 10:28 a.m. Friday
Title : 43min mitigated 67/33 gammas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.0446	7.940e+014	3.940e+001	5.014e+002	1.336e-001	1.700e+000
0.246	1.618e+013	2.362e+001	2.283e+002	4.345e-002	4.199e-001
0.4426	2.204e+012	9.326e+000	5.403e+001	1.826e-002	1.058e-001
0.5907	1.477e+013	1.058e+002	4.921e+002	2.067e-001	9.614e-001
0.6622	7.946e+015	7.018e+004	3.008e+005	1.361e+002	5.831e+002
0.8723	3.325e+013	4.869e+002	1.741e+003	9.161e-001	3.276e+000
1.0024	6.736e+013	1.273e+003	4.194e+003	2.346e+000	7.728e+000
1.2574	1.027e+014	2.946e+003	8.563e+003	5.183e+000	1.507e+001
1.3325	1.501e+013	4.790e+002	1.352e+003	8.311e-001	2.345e+000
1.5767	8.352e+012	3.625e+002	9.434e+002	6.016e-001	1.566e+000
TOTAL:	9.000e+015	7.591e+004	3.188e+005	1.463e+002	6.162e+002

MicroShield 4.00 - Serial #4.00-00128
Westinghouse Hanford Company

Page : 1 File Ref: _____
DOS File: 43M_M_B.MS4 Date: __/__/__
Run Date: April 4, 1997 By: _____
Run Time: 10:39 a.m. Friday Checked: _____
Duration: 0:01:01

Case Title: 43min mitigated 67/33 betas

GEOMETRY 7 - Cylinder Volume - Side Shields

	centimeters	feet and inches	
Dose point coordinate X:	10000.0	328.0	1.0
Dose point coordinate Y:	153.5	5.0	.4
Dose point coordinate Z:	0.0	0.0	.0
Cylinder height:	3.5	0.0	1.4
Cylinder radius:	3100.0	101.0	8.5
Side Clad:	6900.0	226.0	4.5

Source Volume: 1.05667e+8 cm^3 3731.61 cu ft. 6.44822e+6 cu in.

MATERIAL DENSITIES (g/cm^3)

Material	Source Shield	Transition Shield	Side Clad Shield	Immersion Shield
Air		0.00122		0.00122
Concrete			1.6	
Water	1.4			

BUILDUP
Method: Buildup Factor Tables
The material reference is Transition

INTEGRATION PARAMETERS

	Quadrature Order
Radial	10
Circumferential	10
Axial (along Z)	10

SOURCE WAS ENTERED AS ENERGIES ONLY

Page : 2
DOS File: 43M_M_B.MS4
Run Date: April 4, 1997
Run Time: 10:39 a.m. Friday
Title : 43min mitigated 67/33 betas

RESULTS

Energy (MeV)	Activity (photons/sec)	Energy Fluence Rate (MeV/sq cm/sec)		Exposure Rate In Air (mR/hr)	
		No Buildup	With Buildup	No Buildup	With Buildup
0.015	2.036e+015	1.117e-006	1.862e-006	9.584e-008	1.597e-007
0.025	1.028e+015	9.937e-001	3.573e+000	1.714e-002	6.163e-002
0.035	6.552e+014	1.133e+001	8.476e+001	7.180e-002	5.370e-001
0.045	4.647e+014	2.373e+001	3.070e+002	7.891e-002	1.021e+000
0.055	3.514e+014	3.190e+001	5.737e+002	7.180e-002	1.291e+000
0.065	2.775e+014	3.688e+001	7.796e+002	6.694e-002	1.415e+000
0.075	2.250e+014	3.984e+001	8.897e+002	6.494e-002	1.450e+000
0.085	1.872e+014	4.189e+001	9.319e+002	6.508e-002	1.448e+000
0.095	1.578e+014	4.315e+001	9.263e+002	6.604e-002	1.418e+000
0.15	8.260e+014	5.032e+002	7.736e+003	8.286e-001	1.274e+001
0.25	3.202e+014	4.813e+002	4.582e+003	8.879e-001	8.453e+000
0.35	1.639e+014	4.525e+002	3.185e+003	8.729e-001	6.144e+000
0.475	1.288e+014	6.196e+002	3.396e+003	1.216e+000	6.664e+000
0.65	8.030e+013	6.855e+002	2.977e+003	1.331e+000	5.779e+000
0.825	2.989e+013	3.951e+002	1.463e+003	7.488e-001	2.772e+000
1.0	2.102e+013	3.957e+002	1.305e+003	7.293e-001	2.405e+000
1.225	1.141e+013	3.120e+002	9.196e+002	5.523e-001	1.628e+000
1.475	3.941e+012	1.515e+002	4.066e+002	2.560e-001	6.872e-001
1.7	1.005e+012	5.004e+001	1.260e+002	8.128e-002	2.046e-001
1.9	2.480e+011	1.511e+001	3.628e+001	2.374e-002	5.701e-002
2.1	2.611e+010	1.906e+000	4.397e+000	2.903e-003	6.695e-003
2.3	1.398e+008	1.202e-002	2.675e-002	1.777e-005	3.956e-005
TOTAL:	6.970e+015	4.293e+003	3.063e+004	8.033e+000	5.618e+001

ATTACHMENT 4: MITIGATED ACCIDENT MICROSKYSHINE RUNS

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 1M_MIT.SKY Date: __/__/__
Run: 5:14 p.m. By: _____
: April 5, 1997 Checked: _____

CASE: 1 minute mitigated gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	94.27
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	5.73
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	4.73
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

CASE: 1 minute mitigated gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	5.5110e+03	Co-60	9.4474e+00
Eu-154	1.4909e+02		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	2.559e+12	4.714e-20	4.974e-01
2	1.04	1.944e+12	5.073e-20	4.067e-01
3	.84	1.013e+12	5.010e-20	2.093e-01
4	.66	1.851e+14	5.372e-20	4.100e+01
5	.48	5.385e+10	5.776e-20	1.283e-02
6	.40	1.155e+10	5.674e-20	2.703e-03
7	.24	3.642e+11	5.708e-20	8.572e-02
8	.20	1.253e+10	5.586e-20	2.887e-03
9	.12	2.232e+12	4.892e-20	4.503e-01
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		1.933e+14		4.266e+01

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 1M_M_B.SKY
Run: 5:17 p.m.
: April 5, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 1 minute mitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	94.27
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	5.73
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	4.73
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 1 minute mitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	5.773e+09	4.175e-20	9.939e-04
2	1.70	2.340e+10	4.193e-20	4.046e-03
3	1.48	9.176e+10	4.210e-20	1.593e-02
4	1.23	2.657e+11	4.877e-20	5.343e-02
5	1.00	4.894e+11	5.079e-20	1.025e-01
6	.82	6.958e+11	4.991e-20	1.432e-01
7	.65	1.870e+12	5.433e-20	4.189e-01
8	.47	2.997e+12	5.776e-20	7.138e-01
9	.35	3.816e+12	5.547e-20	8.728e-01
10	.25	7.455e+12	5.707e-20	1.754e+00
11	.15	1.923e+13	5.299e-20	4.202e+00
12				
13				
14				
15				
16				
17				
18				
19				
20				
	TOTALS:	3.694e+13		8.282e+00

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 2M_MIT.SKY
Run: 5:20 p.m.
: April 5, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 2 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	92.31
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	7.69
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	6.69
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 2 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.1022e+04	Co-60	1.8895e+01
Eu-154	2.9818e+02		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	5.118e+12	5.187e-20	1.095e+00
2	1.04	3.889e+12	5.538e-20	8.880e-01
3	.84	2.026e+12	5.448e-20	4.550e-01
4	.66	3.702e+14	5.793e-20	8.842e+01
5	.48	1.077e+11	6.173e-20	2.741e-02
6	.40	2.310e+10	6.045e-20	5.759e-03
7	.24	7.284e+11	6.022e-20	1.809e-01
8	.20	2.506e+10	5.872e-20	6.069e-03
9	.12	4.464e+12	5.114e-20	9.415e-01
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		3.866e+14		9.202e+01

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 2M_M_B.SKY
Run: 5:23 p.m.
: April 5, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 2 minute mitigated 67/33 betas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	92.31
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	7.69
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	6.69
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 2 minute mitigated 67/33 betas

SOURCE NUCLIDES:

Source was entered by energy groups.

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.90	1.155e+10	4.657e-20	2.217e-03
2	1.70	4.680e+10	4.666e-20	9.003e-03
3	1.48	1.835e+11	4.667e-20	3.532e-02
4	1.23	5.314e+11	5.351e-20	1.173e-01
5	1.00	9.788e+11	5.540e-20	2.236e-01
6	.82	1.392e+12	5.425e-20	3.113e-01
7	.65	3.740e+12	5.853e-20	9.027e-01
8	.47	5.994e+12	6.171e-20	1.525e+00
9	.35	7.632e+12	5.901e-20	1.857e+00
10	.25	1.491e+13	6.024e-20	3.704e+00
11	.15	3.846e+13	5.554e-20	8.807e+00
12				
13				
14				
15				
16				
17				
18				
19				
20				
	TOTALS:	7.388e+13		1.749e+01

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 5M_MIT.SKY
Run: 11:45 a.m.
: April 6, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 5 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	88.43
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	11.57
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	10.57
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 5 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.7555e+04	Co-60	4.7237e+01
Eu-154	7.4546e+02		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.279e+13	5.721e-20	3.018e+00
2	1.04	9.722e+12	6.054e-20	2.427e+00
3	.84	5.064e+12	5.928e-20	1.238e+00
4	.66	9.254e+14	6.250e-20	2.385e+02
5	.48	2.692e+11	6.597e-20	7.323e-02
6	.40	5.776e+10	6.440e-20	1.534e-02
7	.24	1.821e+12	6.352e-20	4.769e-01
8	.20	6.266e+10	6.174e-20	1.595e-02
9	.12	1.116e+13	5.347e-20	2.461e+00
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		9.664e+14		2.482e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 7M_MIT.SKY
Run: 11:47 a.m.
: April 6, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 7 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	86.49
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	13.51
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	12.51
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 7 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	3.8577e+04	Co-60	6.6131e+01
Eu-154	1.0436e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.791e+13	5.887e-20	4.348e+00
2	1.04	1.361e+13	6.213e-20	3.487e+00
3	.84	7.090e+12	6.075e-20	1.776e+00
4	.66	1.296e+15	6.389e-20	3.413e+02
5	.48	3.769e+11	6.725e-20	1.045e-01
6	.40	8.087e+10	6.559e-20	2.187e-02
7	.24	2.549e+12	6.453e-20	6.783e-01
8	.20	8.772e+10	6.266e-20	2.266e-02
9	.12	1.563e+13	5.419e-20	3.491e+00
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		1.353e+15		3.553e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 10M_MIT.SKY
Run: 11:50 a.m.
: April 6, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 10 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	84.05
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	15.95
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	14.95
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 10 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	5.5110e+04	Co-60	9.4474e+01
Eu-154	1.4909e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	2.559e+13	6.045e-20	6.378e+00
2	1.04	1.944e+13	6.365e-20	5.103e+00
3	.84	1.013e+13	6.216e-20	2.596e+00
4	.66	1.851e+15	6.522e-20	4.978e+02
5	.48	5.385e+11	6.847e-20	1.520e-01
6	.40	1.155e+11	6.672e-20	3.178e-02
7	.24	3.642e+12	6.550e-20	9.837e-01
8	.20	1.253e+11	6.356e-20	3.284e-02
9	.12	2.232e+13	5.490e-20	5.053e+00
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		1.933e+15		5.181e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 12M_MIT.SKY
Run: 11:52 a.m.
: April 6, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 12 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	82.62
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	17.38
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	16.38
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 12 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	6.6131e+04	Co-60	1.1337e+02
Eu-154	1.7891e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	3.071e+13	6.122e-20	7.751e+00
2	1.04	2.333e+13	6.438e-20	6.194e+00
3	.84	1.215e+13	6.283e-20	3.149e+00
4	.66	2.221e+15	6.585e-20	6.031e+02
5	.48	6.462e+11	6.906e-20	1.840e-01
6	.40	1.386e+11	6.727e-20	3.845e-02
7	.24	4.370e+12	6.598e-20	1.189e+00
8	.20	1.504e+11	6.400e-20	3.969e-02
9	.12	2.679e+13	5.525e-20	6.102e+00
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
	TOTALS:	2.319e+15		6.278e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 15M_MIT.SKY
Run: 11:55 a.m.
: April 6, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 15 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	80.69
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	19.31
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	18.31
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 15 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	8.2664e+04	Co-60	1.4171e+02
Eu-154	2.2364e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	3.838e+13	6.212e-20	9.831e+00
2	1.04	2.917e+13	6.524e-20	7.845e+00
3	.84	1.519e+13	6.362e-20	3.985e+00
4	.66	2.776e+15	6.660e-20	7.624e+02
5	.48	8.077e+11	6.975e-20	2.323e-01
6	.40	1.733e+11	6.791e-20	4.852e-02
7	.24	5.463e+12	6.655e-20	1.499e+00
8	.20	1.880e+11	6.454e-20	5.002e-02
9	.12	3.348e+13	5.568e-20	7.688e+00
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
TOTALS:		2.899e+15		7.936e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 17M_MIT.SKY
Run: 11:57 a.m.
: April 6, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 17 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	79.5
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	20.5
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	19.5
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 17 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	9.3686e+04	Co-60	1.6060e+02
Eu-154	2.5346e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	4.350e+13	6.260e-20	1.123e+01
2	1.04	3.305e+13	6.570e-20	8.954e+00
3	.84	1.722e+13	6.404e-20	4.547e+00
4	.66	3.147e+15	6.700e-20	8.693e+02
5	.48	9.154e+11	7.012e-20	2.647e-01
6	.40	1.964e+11	6.826e-20	5.527e-02
7	.24	6.191e+12	6.687e-20	1.707e+00
8	.20	2.130e+11	6.484e-20	5.696e-02
9	.12	3.795e+13	5.593e-20	8.752e+00
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TOTALS:		3.286e+15		9.049e+02

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 20M_MIT.SKY
Run: 12:00 p.m.
: April 6, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 20 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	77.85
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	22.15
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	21.15
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 20 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.1022e+05	Co-60	1.8895e+02
Eu-154	2.9818e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	5.118e+13	6.320e-20	1.334e+01
2	1.04	3.889e+13	6.627e-20	1.063e+01
3	.84	2.026e+13	6.457e-20	5.394e+00
4	.66	3.702e+15	6.751e-20	1.030e+03
5	.48	1.077e+12	7.059e-20	3.135e-01
6	.40	2.310e+11	6.870e-20	6.545e-02
7	.24	7.284e+12	6.728e-20	2.021e+00
8	.20	2.506e+11	6.524e-20	6.742e-02
9	.12	4.464e+13	5.626e-20	1.036e+01
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TOTALS:		3.866e+15		1.073e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 25M_MIT.SKY Date: __/__/__
Run: 12:02 p.m. By: _____
: April 6, 1997 Checked: _____

CASE: 25 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	75.36
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	24.64
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	23.64
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

CASE: 25 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.3777e+05	Co-60	2.3618e+02
Eu-154	3.7273e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	6.397e+13	6.399e-20	1.688e+01
2	1.04	4.861e+13	6.703e-20	1.344e+01
3	.84	2.532e+13	6.527e-20	6.815e+00
4	.66	4.627e+15	6.818e-20	1.301e+03
5	.48	1.346e+12	7.123e-20	3.954e-01
6	.40	2.888e+11	6.929e-20	8.252e-02
7	.24	9.105e+12	6.785e-20	2.547e+00
8	.20	3.133e+11	6.579e-20	8.499e-02
9	.12	5.580e+13	5.673e-20	1.305e+01
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	TOTALS:	4.832e+15		1.354e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 30M_MIT.SKY Date: __/__/__
Run: 12:05 p.m. By: _____
: April 6, 1997 Checked: _____

CASE: 30 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	73.1
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	26.9
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	25.9
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....M		5
Number of Circumferential Segments.....N		5
Number of Vertical Segments.....C		5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 30 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.6533e+05	Co-60	2.8342e+02
Eu-154	4.4727e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	7.676e+13	6.462e-20	2.045e+01
2	1.04	5.833e+13	6.763e-20	1.627e+01
3	.84	3.039e+13	6.583e-20	8.248e+00
4	.66	5.553e+15	6.872e-20	1.573e+03
5	.48	1.615e+12	7.174e-20	4.779e-01
6	.40	3.466e+11	6.978e-20	9.972e-02
7	.24	1.093e+13	6.834e-20	3.079e+00
8	.20	3.759e+11	6.628e-20	1.027e-01
9	.12	6.696e+13	5.715e-20	1.578e+01
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TOTALS:		5.798e+15		1.638e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 35M_MIT.SKY Date: __/__/__
Run: 12:07 p.m. By: _____
: April 6, 1997 Checked: _____

CASE: 35 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	71.03
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	28.97
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	27.97
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 35 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	1.9288e+05	Co-60	3.3066e+02
Eu-154	5.2182e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	8.956e+13	6.513e-20	2.405e+01
2	1.04	6.805e+13	6.813e-20	1.912e+01
3	.84	3.545e+13	6.629e-20	9.690e+00
4	.66	6.478e+15	6.917e-20	1.848e+03
5	.48	1.885e+12	7.218e-20	5.609e-01
6	.40	4.043e+11	7.019e-20	1.170e-01
7	.24	1.275e+13	6.877e-20	3.615e+00
8	.20	4.386e+11	6.671e-20	1.206e-01
9	.12	7.813e+13	5.753e-20	1.853e+01
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TOTALS:		6.765e+15		1.924e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1 File Ref: _____
File: 40M_MIT.SKY Date: __/__/__
Run: 12:10 p.m. By: _____
: April 6, 1997 Checked: _____

CASE: 40 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	69.1
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	30.9
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	29.9
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 40 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.2044e+05	Co-60	3.7789e+02
Eu-154	5.9636e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.024e+14	6.557e-20	2.767e+01
2	1.04	7.777e+13	6.855e-20	2.198e+01
3	.84	4.051e+13	6.668e-20	1.114e+01
4	.66	7.404e+15	6.956e-20	2.124e+03
5	.48	2.154e+12	7.257e-20	6.445e-01
6	.40	4.621e+11	7.056e-20	1.344e-01
7	.24	1.457e+13	6.917e-20	4.155e+00
8	.20	5.013e+11	6.711e-20	1.387e-01
9	.12	8.929e+13	5.789e-20	2.131e+01
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	TOTALS:	7.731e+15		2.211e+03

MicroSkyshine

(Safety Analysis and Risk Assessment - 1.16-007)

Page: 1
File: 43M_MIT.SKY
Run: 6:32 a.m.
: July 23, 1997

File Ref: _____
Date: __/__/__
By: _____
Checked: _____

CASE: 43 minute mitigated 67/33 gammas

GEOMETRY: Vertical cylinder area source behind a wall

DIMENSIONS (meters):

Distance between wall and detector.....	X	68.
Depth of source behind wall.....	Y	0.956
Offset of detector.....	Z	0.
Depth of dose point.....	H	-0.544
Distance between center of source and wall...	R1	32.
Thickness of cover slab.....	T1	0.
Thickness of second shield.....	T2	0.
Radius of source.....	W	31.
Height of source.....	L	0.035

INTEGRATION PARAMETERS:

Number of Radial Segments.....	M	5
Number of Circumferential Segments.....	N	5
Number of Vertical Segments.....	C	5
Quadrature Order.....		16

MATERIAL DENSITIES (g/cc):

Ambient air: .0012

Material	Cover Slab	Lower Shield	Volume Source
Air			
Water			1.4
Concrete			
Iron			
Lead			
Zirconium			
Urania			

Buildup factor based on: AIR.

Page 2

CASE: 43 minute mitigated 67/33 gammas

SOURCE NUCLIDES:

Nuclide	Curies	Nuclide	Curies
Ba-137m	2.3697e+05	Co-60	4.0624e+02
Eu-154	6.4109e+03		

RESULTS:

Group #	Energy (mev)	Activity (photons/sec)	Dose point rads/photon	Dose rate (mr/hr)
1	1.30	1.100e+14	6.581e-20	2.986e+01
2	1.04	8.361e+13	6.878e-20	2.371e+01
3	.84	4.355e+13	6.690e-20	1.201e+01
4	.66	7.959e+15	6.978e-20	2.290e+03
5	.48	2.315e+12	7.278e-20	6.949e-01
6	.40	4.968e+11	7.076e-20	1.449e-01
7	.24	1.566e+13	6.939e-20	4.481e+00
8	.20	5.389e+11	6.733e-20	1.496e-01
9	.12	9.598e+13	5.810e-20	2.299e+01
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TOTALS:		8.311e+15		2.384e+03

ATTACHMENT 5: PEER REVIEW CHECKLIST

CHECKLIST FOR PEER REVIEW

Document Reviewed: HNF-SD-WM-CN-110, Rev. 0,*Consequences of a Radioactive Surface Pool Resulting from Waste Transfer Operations between Tanks 241-C-106 and 241-AY-102*

Scope of Review: Entire document.

Yes	No	NA	
☑	☐	☐ *	Previous reviews complete and cover analysis, up to scope of this review, with no gaps.
☑	☐	☐	Problem completely defined.
☑	☐	☐	Accident scenarios developed in a clear and logical manner.
☑	☐	☐	Necessary assumptions explicitly stated and supported.
☑	☐	☐	Computer codes and data files documented.
☑	☐	☐	Data used in calculations explicitly stated in document.
☑	☐	☐	Data checked for consistency with original source information as applicable.
☑	☐	☐	Mathematical derivations checked including dimensional consistency of results.
☑	☐	☐	Models appropriate and used within range of validity or use outside range of established validity justified.
☑	☐	☐	Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations.
☑	☐	☐	Software input correct and consistent with document reviewed.
☑	☐	☐	Software output consistent with input and with results reported in document reviewed.
☑	☐	☐	Limits/criteria/guidelines applied to analysis results are appropriate and referenced. Limits/criteria/guidelines checked against references.
☑	☐	☐	Safety margins consistent with good engineering practices.
☑	☐	☐	Conclusions consistent with analytical results and applicable limits.
☑	☐	☐	Results and conclusions address all points required in the problem statement.
☑	☐	☐	Format consistent with appropriate NRC Regulatory Guide or other standards
☐		☑ *	Review calculations, comments, and/or notes are attached.
☑	☐	☐	**Document approved.**

SR Gedeon — 29 July 97

Reviewer (Printed Name and Signature) — Date

* Any calculations, comments, or notes generated as part of this review should be signed, dated and attached to this checklist. Such material should be labeled and recorded in such a manner as to be intelligible to a technically qualified third party.

DISTRIBUTION SHEET

To	From	Page 1 of 1
Project W-320 DE&S Hanford, Inc.	Fluor Daniel Northwest Safety Analysis & Risk Assessment	Date 07/30/97
Project Title/Work Order		EDT No. 621244
Consequences of a Radioactive Surface Pool Resulting from Waste Transfer Operations between Tanks 241-C-106 and 241-AY-102		ECN No. N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
J.P. Harris	S2-48	X			
B.E. Hey	A3-34		X (pages 1-21)		
R.J. Van Vleet	A3-34	X			
S.R. Gedeon	H0-35	X			
Central Files	A3-88	X (Original + 1)			
Docket Files	B1-17	X (2)			
TWRS S&L Files	A2-26	X (2)			