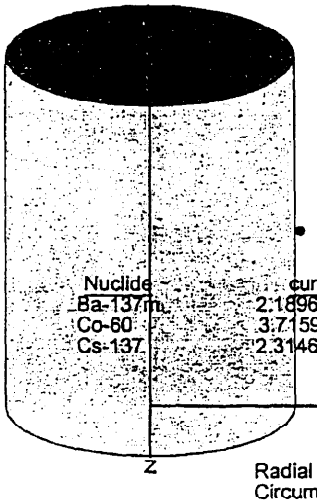
Attachment 2 – Individual V-tank Sludge Exposure Calculations

MicroShield v5.05 (5.05-00340)
BBWI

Page : 1
DOS File : V1PKG.MS5
Run Date: August 7, 2001
Run Time: 10:25:47 AM
Duration : 00:00:14

File Ref:
Date: 8/7/01
By: JRGilm
Checked:

Case Title: V-1 Sludge Package
Description: 49-gallons of V-1 Sludge in 55-gal drum.
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	72.31 cm	2 ft 4.5 in
Radius	28.258 cm	11.1 in

Dose Points

	X	Y	Z
# 1	29.3875 cm	36.155 cm	0 cm
	11.6 in	1 ft 2.2 in	0.0 in
# 2	58.3875 cm	36.155 cm	0 cm
	1 ft 11.0 in	1 ft 2.2 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.81e+05 cm³	V123 SLUDGE	1.02
Shield 1	.13 cm	Iron	7.86
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	2.1896e+000	8.1016e+010	1.2071e+001	4.4664e+005
Co-60	3.7159e-002	1.3749e+009	2.0486e-001	7.5797e+003
Cs-137	2.3146e+000	8.5640e+010	1.2760e+001	4.7213e+005

Buildup
The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results - Dose Point # 1 - (29.3875,36.155,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.677e+09	1.856e-02	9.267e-02	1.546e-04	7.719e-04
0.0322	3.095e+09	4.598e-02	2.341e-01	3.700e-04	1.884e-03
0.0364	1.126e+09	2.270e-01	1.411e+00	1.290e-03	8.019e-03
0.6616	7.290e+10	1.085e+06	2.628e+06	2.104e+03	5.094e+03
0.6938	2.243e+05	3.578e+00	8.476e+00	6.908e-03	1.636e-02
1.1732	1.375e+09	4.716e+04	9.052e+04	8.428e+01	1.618e+02
1.3325	1.375e+09	5.669e+04	1.039e+05	9.835e+01	1.802e+02
TOTALS:	8.155e+10	1.189e+06	2.822e+06	2.286e+03	5.436e+03

Results - Dose Point # 2 - (58.3875,36.155,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.677e+09	6.992e-03	3.491e-02	5.824e-05	2.908e-04
0.0322	3.095e+09	1.733e-02	8.837e-02	1.394e-04	7.112e-04
0.0364	1.126e+09	8.870e-02	5.612e-01	5.040e-04	3.189e-03
0.6616	7.290e+10	3.013e+05	6.785e+05	5.841e+02	1.315e+03
0.6938	2.243e+05	9.912e-01	2.187e+00	1.914e-03	4.223e-03
1.1732	1.375e+09	1.276e+04	2.323e+04	2.280e+01	4.151e+01
1.3325	1.375e+09	1.525e+04	2.661e+04	2.646e+01	4.616e+01
TOTALS:	8.155e+10	3.293e+05	7.284e+05	6.334e+02	1.403e+03

MicroShield v5.05 (5.05-00340)
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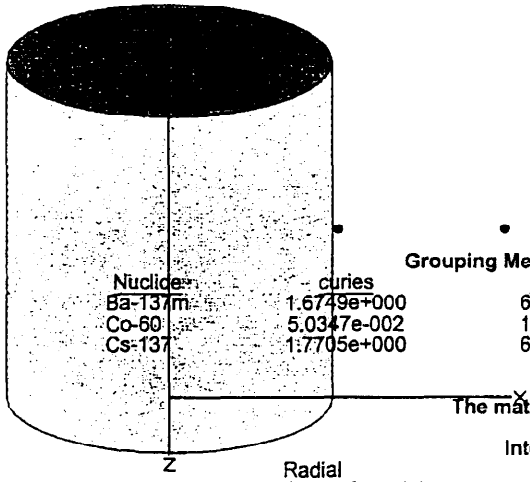
Page : 1
DOS File : V2PKG.MS5
Run Date : August 7, 2001
Run Time : 10:31:40 AM
Duration : 00:00:13

File Ref:
Date: 8/7/01
By: JR Gilb
Checked:

Case Title: V-2 Sludge Package
Description: 42-gallons of V-2 Sludge in 55-gal drum.
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	61.98 cm	2 ft 0.4 in
Radius	28.258 cm	11.1 in

Dose Points

	X	Y	Z
# 1	29.3875 cm 11.6 in	30.99 cm 1 ft 0.2 in	0 cm 0.0 in
# 2	58.3875 cm 1 ft 11.0 in	30.99 cm 1 ft 0.2 in	0 cm 0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.55e+05 cm³	V123 SLUDGE	1.02
Shield 1	.13 cm	Iron	7.86
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.6749e+000	6.1971e+010	1.0773e+001	3.9858e+005
Co-60	5.0347e-002	1.8628e+009	3.2382e-001	1.1981e+004
Cs-137	1.7705e+000	6.5508e+010	1.1387e+001	4.2134e+005

Buildup
The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results - Dose Point # 1 - (29.3875,30.99,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.283e+09	1.602e-02	7.982e-02	1.334e-04	6.649e-04
0.0322	2.367e+09	3.964e-02	2.015e-01	3.190e-04	1.622e-03
0.0364	8.614e+08	1.961e-01	1.222e+00	1.114e-03	6.944e-03
0.6616	5.576e+10	9.594e+05	2.284e+06	1.860e+03	4.428e+03
0.6938	3.039e+05	5.601e+00	1.304e+01	1.081e-02	2.519e-02
1.1732	1.863e+09	7.342e+04	1.387e+05	1.312e+02	2.479e+02
1.3325	1.863e+09	8.812e+04	1.590e+05	1.529e+02	2.758e+02
TOTALS:	6.400e+10	1.121e+06	2.582e+06	2.144e+03	4.952e+03

Results - Dose Point # 2 - (58.3875,30.99,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	1.283e+09	6.209e-03	3.097e-02	5.172e-05	2.580e-04
0.0322	2.367e+09	1.538e-02	7.837e-02	1.238e-04	6.307e-04
0.0364	8.614e+08	7.818e-02	4.934e-01	4.442e-04	2.803e-03
0.6616	5.576e+10	2.442e+05	5.433e+05	4.734e+02	1.053e+03
0.6938	3.039e+05	1.422e+00	3.102e+00	2.746e-03	5.989e-03
1.1732	1.863e+09	1.823e+04	3.289e+04	3.259e+01	5.877e+01
1.3325	1.863e+09	2.178e+04	3.766e+04	3.779e+01	6.534e+01
TOTALS:	6.400e+10	2.842e+05	6.139e+05	5.437e+02	1.177e+03

MicroShield v5.05 (5.05-00340)
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Page : 1
DOS File : V3PKG.MS5
Run Date : August 7, 2001
Run Time : 10:35:40 AM
Duration : 00:00:13

File Ref: _____
Date: 8/7/01
By: JR. Bla
Checked: _____

Case Title: V-3 Sludge Package
Description: 15-gallons of V-3 Sludge in 55-gal drum.
Geometry: 7 - Cylinder Volume - Side Shields

Source Dimensions

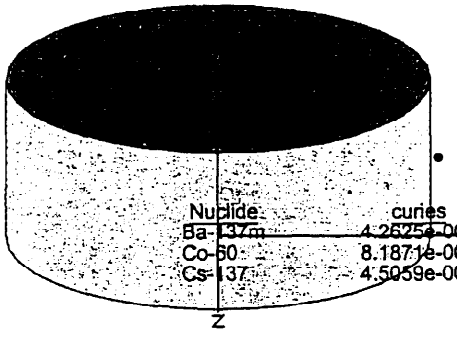
Height	22.14 cm	8.7 in
Radius	28.258 cm	11.1 in

Dose Points

	X	Y	Z
# 1	29.3875 cm	11.07 cm	0 cm
	11.6 in	4.4 in	0.0 in
# 2	58.3875 cm	11.07 cm	0 cm
	1 ft 11.0 in	4.4 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	5.55e+04 cm³	V123 SLUDGE	1.02
Shield 1	.13 cm	Iron	7.86
Transition		Air	0.00122
Air Gap		Air	0.00122



Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	4.2625e-001	1.5771e+010	7.6749e+000	2.8397e+005
Co-60	8.1871e-003	3.0292e+008	1.4741e-001	5.4543e+003
Cs-137	4.5059e-001	1.6672e+010	8.1130e+000	3.0018e+005

Buildup
The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results - Dose Point # 1 - (29.3875,11.07,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.265e+08	1.040e-02	5.234e-02	8.661e-05	4.360e-04
0.0322	6.024e+08	2.587e-02	1.329e-01	2.082e-04	1.070e-03
0.0364	2.192e+08	1.339e-01	8.448e-01	7.610e-04	4.800e-03
0.6616	1.419e+10	5.560e+05	1.119e+06	1.078e+03	2.170e+03
0.6938	4.941e+04	2.065e+00	4.076e+00	3.986e-03	7.870e-03
1.1732	3.029e+08	2.570e+04	4.247e+04	4.593e+01	7.589e+01
1.3325	3.029e+08	3.046e+04	4.840e+04	5.284e+01	8.397e+01
TOTALS:	1.595e+10	6.122e+05	1.210e+06	1.177e+03	2.330e+03

Results - Dose Point # 2 - (58.3875,11.07,0) cm

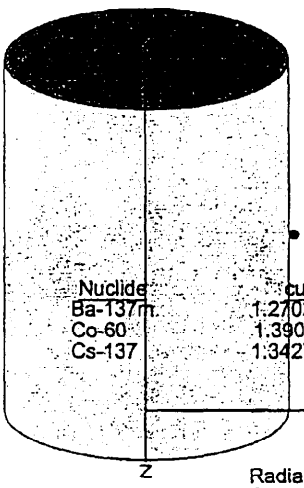
Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	3.265e+08	3.146e-03	1.543e-02	2.620e-05	1.285e-04
0.0322	6.024e+08	7.723e-03	3.867e-02	6.215e-05	3.112e-04
0.0364	2.192e+08	3.589e-02	2.206e-01	2.039e-04	1.253e-03
0.6616	1.419e+10	7.407e+04	1.582e+05	1.436e+02	3.068e+02
0.6938	4.941e+04	2.754e-01	5.770e-01	5.317e-04	1.114e-03
1.1732	3.029e+08	3.486e+03	6.092e+03	6.229e+00	1.089e+01
1.3325	3.029e+08	4.151e+03	6.968e+03	7.201e+00	1.209e+01
TOTALS:	1.595e+10	8.171e+04	1.713e+05	1.570e+02	3.297e+02

MicroShield v5.05 (5.05-00340)
BBWI

Page : 1
DOS File : V9PKG.MS5
Run Date: August 7, 2001
Run Time: 10:39:19 AM
Duration : 00:00:14

File Ref:
Date: 8/7/01
By:
Checked:

Case Title: V-9 Sludge Package
Description: 50-gallons of V-9 Sludge in 55-gal drum.
Geometry: 7 - Cylinder Volume - Side Shields



Source Dimensions

Height	73.787 cm	2 ft 5.1 in
Radius	28.258 cm	11.1 in

Dose Points

	X	Y	Z
# 1	29.3875 cm	36.8935 cm	0 cm
	11.6 in	1 ft 2.5 in	0.0 in
# 2	58.3875 cm	36.8935 cm	0 cm
	1 ft 11.0 in	1 ft 2.5 in	0.0 in

Shields

Shield Name	Dimension	Material	Density
Source	1.85e+05 cm³	V9 SLUDGE	1.3
Shield 1	.13 cm	Iron	7.86
Transition		Air	0.00122
Air Gap		Air	0.00122

Source Input
Grouping Method : Actual Photon Energies

Nuclide	curies	becquerels	µCi/cm³	Bq/cm³
Ba-137m	1.2702e+000	4.6999e+010	6.8626e+000	2.5392e+005
Co-60	1.3906e-001	5.1454e+009	7.5131e-001	2.7798e+004
Cs-137	1.3427e+000	4.9681e+010	7.2543e+000	2.6841e+005

Buildup
The material reference is : Source

Integration Parameters

Radial	20
Circumferential	20
Y Direction (axial)	20

Results - Dose Point # 1 - (29.3875,36.8935,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	9.730e+08	3.369e-03	4.444e-03	2.806e-05	3.702e-05
0.0322	1.795e+09	8.488e-03	1.127e-02	6.831e-05	9.066e-05
0.0364	6.533e+08	4.799e-02	6.793e-02	2.727e-04	3.859e-04
0.6616	4.229e+10	5.061e+05	1.155e+06	9.812e+02	2.239e+03
0.6938	8.393e+05	1.078e+01	2.423e+01	2.081e-02	4.678e-02
1.1732	5.145e+09	1.446e+05	2.755e+05	2.584e+02	4.923e+02
1.3325	5.145e+09	1.746e+05	3.203e+05	3.029e+02	5.556e+02
TOTALS:	5.600e+10	8.253e+05	1.750e+06	1.542e+03	3.287e+03

Results - Dose Point # 2 - (58.3875,36.8935,0) cm

Energy MeV	Activity photons/sec	Fluence Rate MeV/cm²/sec No Buildup	Fluence Rate MeV/cm²/sec With Buildup	Exposure Rate mR/hr No Buildup	Exposure Rate mR/hr With Buildup
0.0318	9.730e+08	1.266e-03	1.661e-03	1.055e-05	1.384e-05
0.0322	1.795e+09	3.149e-03	4.156e-03	2.534e-05	3.344e-05
0.0364	6.533e+08	1.679e-02	2.377e-02	9.540e-05	1.351e-04
0.6616	4.229e+10	1.438e+05	3.079e+05	2.788e+02	5.969e+02
0.6938	8.393e+05	3.056e+00	6.453e+00	5.901e-03	1.246e-02
1.1732	5.145e+09	3.999e+04	7.244e+04	7.146e+01	1.295e+02
1.3325	5.145e+09	4.801e+04	8.399e+04	8.329e+01	1.457e+02
TOTALS:	5.600e+10	2.318e+05	4.643e+05	4.336e+02	8.721e+02