

From: Kouretas, Malgorzata E CIV USARMY ARDEC (US)
To: [Lawyer, Dennis](#)
Subject: [External_Sender] RE: Department of the Army, Request for Additional Information Concerning Application for a License Amendment, Control 601500, Lic. No. SUB-348, Docket No. 04006377
Date: Thursday, January 11, 2018 2:16:22 PM
Attachments: [D&D Output Detail Report for U-238 Resuspension Factor of 1E-6.pdf](#)

Attached is the detailed D&D output report as requested.

V/r,
Margaret

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HMSS/RGN MATERIALS-C02



DandD Building Occupancy Scenario

DandD Version: 2.4.0
Run Date/Time: 1/9/2018 1:47:56 PM
Site Name: Picatinny
Description: U-238 Revised resuspension factor
FileName: C:\Users\passigm\DandD_Docs\U-238 Revised.mcd

Options:

Implicit progeny doses NOT included with explicit parent doses
 Nuclide concentrations are distributed among all progeny
 Number of simulations: 100
 Seed for Random Generation: 8718721
 Averages of sampled values used for behavioral and metabolic type parameters
 Averages of sampled values not used for derived behavioral or metabolic parameters

External Pathway is ON
 Inhalation Pathway is ON
 Secondary Ingestion Pathway is ON

Initial Activities:

Nuclide	Area of Contamination (m ²)	Distribution
238U	UNLIMITED	CONSTANT(dpm/100 cm**2)
Justification for concentration: Site Specific Value equating to 25 mrem/yr when applying the indoor resuspension factor of 1E-6 m-1		Value 1.40E+03

Chain Data:

Number of chains: 1

Chain No. 1: 238U
 Nuclides in chain: 16

Nuclide	Chain Position	Half Life	First Parent	Fractional Yield	Second Parent	Fractional Yield	Ingestion CEDE Factor (Sv/Bq)	Inhalation CEDE Factor (Sv/Bq)	Surface Dose Rate Factor ((Sv/d)/(Bq/m ²))	15 cm Dose Rate Factor ((Sv/d)/(Bq/m ³))
238U	1	1.63E+12					6.88E-08	3.20E-05	4.76E-14	4.76E-17
234Th	2	2.41E+01	1	1	0	0	3.69E-09	9.47E-09	7.18E-13	1.12E-14

234mPa	Implicit		2	0.998			0.00E+00	0.00E+00	1.32E-12	3.62E-14
234Pa	Implicit		2	0.002	0	0.0013	5.84E-10	2.20E-10	1.59E-10	4.65E-12
234U	3	8.93E+07	2	1	0	0	7.66E-08	3.58E-05	6.46E-14	1.85E-16
230Th	4	2.81E+07	3	1	0	0	1.48E-07	8.80E-05	6.48E-14	5.52E-16
226Ra	5	5.84E+05	4	1	0	0	3.58E-07	2.32E-06	5.56E-13	1.42E-14
222Rn	6	3.82E+00	5	1	0	0	0.00E+00	0.00E+00	3.41E-14	9.81E-16
218Po	Implicit		6	1			0.00E+00	0.00E+00	7.67E-16	2.27E-17
214Pb	Implicit		6	0.9998			1.69E-10	2.11E-09	2.10E-11	5.78E-13
218At	Implicit		6	0.0002			0.00E+00	0.00E+00	0.00E+00	0.00E+00
214Bi	Implicit		6	1			7.64E-11	1.78E-09	1.22E-10	3.77E-12
214Po	Implicit		6	0.9998			0.00E+00	0.00E+00	7.02E-15	2.07E-16
210Pb	7	8.15E+03	6	1	0	0	1.45E-06	3.67E-06	2.14E-13	1.13E-15
210Bi	8	5.01E+00	7	1	0	0	1.73E-09	5.29E-08	9.06E-14	1.61E-15
210Po	9	1.38E+02	8	1	0	0	5.14E-07	2.54E-06	7.16E-16	2.11E-17

Initial Concentrations:

Note: All reported values are the upper bound of the symmetric 95% confidence interval for the 0.9 quantile value

Nuclide	Surface Concentration (dpm/100 cm**2)
238U	1.40E+03
234Th	0.00E+00
234mPa	0.00E+00
234Pa	0.00E+00
234U	0.00E+00
230Th	0.00E+00
226Ra	0.00E+00
222Rn	0.00E+00
218Po	0.00E+00
214Pb	0.00E+00
218At	0.00E+00
214Bi	0.00E+00
214Po	0.00E+00
210Pb	0.00E+00
210Bi	0.00E+00
210Po	0.00E+00

Model Parameters:

General Parameters:

Parameter Name	Description	Distribution
To:Time In Building		CONSTANT(hr/week)

	The time in the building during the occupancy period	
Behavioral category: Default value used		Value 4.50E+01
Tto:Occupancy Period	The duration of the occupancy exposure period	CONSTANT(days)
Behavioral category: Default value used		Value 3.65E+02
Vo:Breathing Rate	The average volumetric breathing rate during building occupancy for an 8-hour work day	CONSTANT(m**3/hr)
Metabolic category: Default value used		Value 1.40E+00
RFo*:Resuspension Factor	Effective resuspension factor during the occupancy period = RFo * FI	CONSTANT(1/m)
Physical category: Justification for modification: NUREG-1720		Value 1.00E-06
		Default DERIVED(1/m)
GO*:Ingestion Rate	Effective secondary ingestion transfer rate of removable surface activity from building surfaces to the mouth during building occupancy = GO * FI	DERIVED(m**2/hr)
Behavioral category: Default value used		
Tstart:Start Time	The start time of the scenario in days	CONSTANT(days)
Program Control category: Default value used		Value 0.00E+00
Tend:End Time	The ending time of the scenario in days	CONSTANT(days)
Program Control category: Default value used		Value 3.65E+02
dt:Time Step Size	The time step size	CONSTANT(days)
Program Control category: Default value used		Value 3.65E+02
Pstep:Print Step Size	The time steps for the history file. Doses will be written to the history file every n time steps	CONSTANT(none)
Program Control category: Default value used		Value 1.00E+00
AOExt:External Exposure Area	Minimum surface area to which occupant is exposed via external radiation during occupancy period	CONSTANT(m**2)
Behavioral category: Default value used		Value 1.00E+01
AOInh:Inhalation Exposure Area	Minimum surface area to which occupant is exposed via inhalation during occupancy period	CONSTANT(m**2)
Behavioral category: Default value used		Value 1.00E+01
AOIng:Secondary Ingestion Exposure Area	Minimum surface area to which occupant is exposed via secondary ingestion during occupancy period	CONSTANT(m**2)
Behavioral category: Default value used		Value 1.00E+01
AO:Exposure Area	Minimum surface area to which occupant is exposed during the occupancy period	DERIVED(m**2)
Behavioral category: Default value used		
FI:Loose Fraction	Fraction of surface contamination available for resuspension and ingestion	CONSTANT(none)
Physical category: Default value used		Value 1.00E-01
Rfo:Loose Resuspension Factor	Resuspension factor for loose contamination	CONTINUOUS LOGARITHMIC(1/m)
Physical category: Default value used		Value Probability
		9.12E-06 0.00E+00

		1.10E-04	7.67E-01
		1.46E-04	9.09E-01
		1.62E-04	9.50E-01
		1.85E-04	9.90E-01
		1.90E-04	1.00E+00
GO:Loose Ingestion Rate	The secondary ingestion transfer rate of loose removable surface activity from building surfaces to the mouth during building occupancy	CONSTANT(m**2/hr)	
Behavioral category: Default value used		Value	1.10E-04

Correlation Coefficients:

None

Summary Results:

90.00% of the 100 calculated TEDE values are < 2.50E+01 mrem/year.
 The 95 % Confidence Interval for the 0.9 quantile value of TEDE is 2.50E+01 to 2.50E+01 mrem/year

Detailed Results:

Note: All reported values are the upper bound of the symmetric 95% confidence interval for the 0.9 quantile value

Concentration at Time of Peak Dose:

Nuclide	Surface Concentration (dpm/100 cm**2)
238U	1.40E+03
234Th	1.27E+03
234mPa	1.26E+03
234Pa	2.53E+00
234U	1.64E-03
230Th	4.55E-09
226Ra	4.55E-13
222Rn	4.37E-13
218Po	4.37E-13
214Pb	4.37E-13
218At	8.75E-17
214Bi	4.37E-13
214Po	4.37E-13
210Pb	0.00E+00
210Bi	4.23E-14
210Po	4.90E-14

Pathway Dose from All Nuclides (mrem)

	External	Inhalation	
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All Pathways Dose			Secondary Ingestion
2.50E+01	4.95E-02	2.45E+01	4.33E-01

Radionuclide Dose through All Active Pathways (mrem)

Nuclide	All Pathways Dose
238U	2.49E+01
234Th	4.14E-02
234mPa	2.71E-02
234Pa	6.55E-03
234U	3.27E-05
230Th	2.22E-10
226Ra	1.28E-15
222Rn	2.42E-19
218Po	5.45E-21
214Pb	1.50E-16
218At	0.00E+00
214Bi	8.68E-16
214Po	4.99E-20
210Pb	0.00E+00
210Bi	1.60E-18
210Po	1.76E-16
All Nuclides	2.50E+01

Dose from Each Nuclide through Each Active Pathway (mrem)

Nuclide	External	Inhalation	Secondary Ingestion
238U	1.08E-03	2.45E+01	4.13E-01
234Th	1.48E-02	6.55E-03	2.01E-02
234mPa	2.71E-02	0.00E+00	0.00E+00
234Pa	6.55E-03	3.04E-07	6.35E-06
234U	1.72E-09	3.21E-05	5.40E-07
230Th	4.79E-15	2.19E-10	2.89E-12
226Ra	4.11E-18	5.76E-16	6.99E-16
222Rn	2.42E-19	0.00E+00	0.00E+00
218Po	5.45E-21	0.00E+00	0.00E+00
214Pb	1.49E-16	5.04E-19	3.17E-19
218At	0.00E+00	0.00E+00	0.00E+00
214Bi	8.67E-16	4.25E-19	1.43E-19
214Po	4.99E-20	0.00E+00	0.00E+00
210Pb	0.00E+00	0.00E+00	0.00E+00

210Bi	6.23E-20	1.22E-18	3.14E-19
210Po	5.70E-22	6.79E-17	1.08E-16