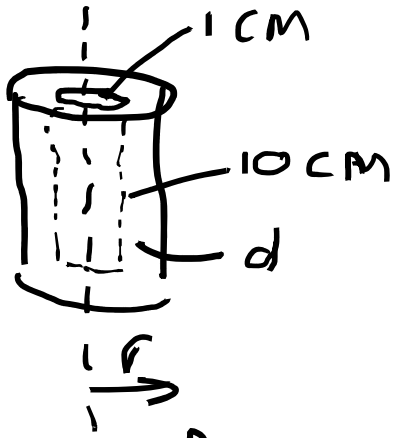
30]



Limiet $\dot{D}_{opp} = 50\,\mu Gy/h$

$10\,MBq\ {}^{60}Co$

a) $\dot{D} = \Gamma \frac{A}{r^2} T \Rightarrow 50\,\mu Gy/h = 0{,}305\,\mu Gy/h\,m^2/MBq \frac{10\,MBq}{r^2} T$

$\Rightarrow \frac{T}{r^2} = 16{,}4$

d	r	T	T/r^2
0,5	1	0,63	6300
1,5	2	0,38	9,50
5,5	6	$4{,}4\,10^{-2}$	12,2
5,0	5,5	$6{,}0\,10^{-2}$	19,8

r ligt tussen 5,5 en 6,0 cm → 6 cm. d = 5,5 cm.

b) Bydrage U is 20 μSv/h, dus bydrage Co 30 μSv/h.

$$\dot{D} = \Gamma \frac{A}{r^2} T \Rightarrow 30 = 0{,}305 \frac{10}{r^2} T$$

$T_{1/2} = 5{,}8$

d	r	T	$T_{1/6^2}$
1	1,5	0,3	1333
4	4,5	0,01	4,9
7,5	4,0	$1{,}6\,10^{-2}$	10,0

dikte uraancontainer 4 cm.

$$\frac{30}{0{,}305 \cdot 10} = \frac{0{,}305}{0{,}305} \frac{10}{r^2} T \qquad \frac{30}{0{,}305 \cdot 10} = \frac{T}{r^2}$$

c) $m = \rho \cdot V$

$V_{cylinder} = \pi (d+0{,}5)^2 \cdot (10+2d) = 2375\ cm^3$

$V_{holte} = \pi \cdot 0{,}5^2 \cdot 10 = 7{,}85\ cm^3$

$m = \rho (V_{cyl} - V_{holte}) = 11{,}35 \cdot 2367 = 26{,}8\ kg$

d) $d = 4\ cm$

$m = 21{,}5\ kg$

ej $m = 21{,}5\,kg$

$M_U = 238 \cdot 99{,}75\% + 235 \cdot 0{,}25\% = 237{,}99$ molmassen.

1 mol U $\hat{=}$ 237,99 g $\hat{=}$ $6{,}02 \cdot 10^{23}$ atomen

$21{,}5 \cdot 10^3\,g \;\hat{=}\; \frac{21{,}5 \cdot 10^3}{237{,}99} \cdot 6{,}02 \cdot 10^{23} = 5{,}44 \cdot 10^{25}$ atomen

$A \Rightarrow N$

^{238}U: $A = \frac{\ln 2}{4{,}468 \cdot 10^9\,j} \cdot 5{,}44 \cdot 10^{25} \cdot 99{,}75\% = 267\,MBq.$

^{235}U: $A = \frac{\ln 2}{7{,}038 \cdot 10^8\,j} \cdot 5{,}44 \cdot 10^{25} \cdot 0{,}25\% = 4{,}3\,MBq.$

Total: $267 + 4{,}3 = 271\,MBq.$

3) $\boxed{\frac{dA}{dt} = P - \lambda A} \overset{=}{\uparrow} 0$

eden wicht-

$$A = P/\lambda = \frac{40\ MBq/m^3 \cdot 4{,}0\ m^3/Luft}{\ln 2 / 4{,}96\ h} = 3{,}5\ GBq \cdot 95\,\% = 3{,}3\ GBq$$

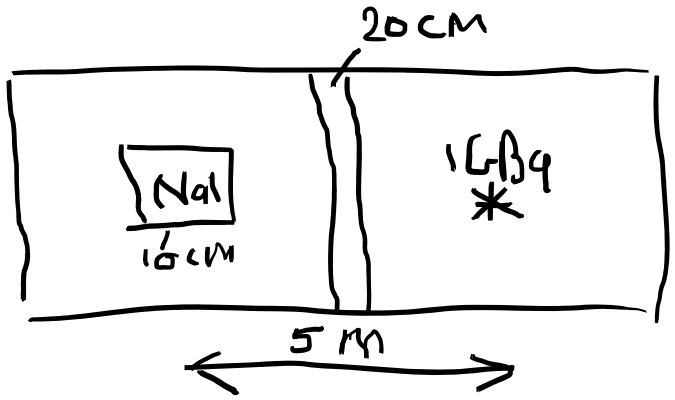
b) $\dot{D} = \Gamma \frac{A}{r^2} = \frac{0{,}436 \cdot 3{,}3 \cdot 10^3}{2^2} = 0{,}36\ mGy/h$

c) $T = \frac{1\ \mu Gy/h}{360\ \mu Gy/h} = 2{,}8\,10^{-3}$

Beton: 88 cm

Bunker: 56 cm

31)



a) $\dot{D} = \Gamma \frac{A}{r^2} T$

$\dot{D} = \Gamma \frac{A}{r^2} e^{-\frac{\mu}{\rho} \rho d}$

$\Rightarrow d = \frac{\ln\left(\frac{\dot{D} r^2}{\Gamma A}\right)}{-\frac{\mu}{\rho}\rho} = \frac{\ln\left(\frac{10^{-5} \cdot 0{,}5^2}{0{,}078 \cdot 10^{-6} \cdot 10^3}\right)}{-10{,}8 \cdot 10^{-3}\ 11350}$

$= 2{,}67\,\text{cm}$

b) $\Phi_{5m} = \frac{\Phi_0}{4\pi R^2} T_{beton}\, T_{lead}$

$T_{beton} = e^{-\mu d} = e^{-7{,}7\,10^3 \cdot 2350 \cdot 0{,}20} = 2{,}68\,10^{-2}$

$T_{lead} = e^{-\mu d} = e^{-10{,}8 \cdot 10^{-3} \cdot 11350 \cdot 0{,}10} = 4{,}75 \cdot 10^{-6}$

$$\Phi_{5m} = \frac{10^9 s^{-1}}{4\pi (5m)^2} \cdot 2,65 \cdot 10^2 \cdot 4,75\,10^{-6} = 0,403\ s^{-1}m^{-2}$$

$$\uparrow \quad 0,344$$

$$f_\gamma = 0,946 \cdot 0,898 = 0,85$$

Fluentietempo is 0,344 fotonen per m^2 per sec.

Op het NaI met opp $(0,1\,m)^2$ vallen $0,344 \cdot 10^{-3}$ fotonen / sec.

100 fotonen $\hat{=}$ 60 pulsen.

$3,44 \cdot 10^{-3}$ fotonen/sec $\hat{=}$ $2,1 \cdot 10^{-3}$ pulsen/sec $< 10^{-2}$ pulsen/sec.