



Q-7

March 9, 2005

U.S. Nuclear Regulatory Commission, Region I
Licensing Assistant Branch
475 Allendale Road
King of Prussia, PA 19406-1415

Re: Amendment to License #45-17195-01

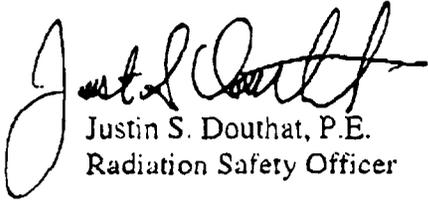
Docket No. 03012341
Control No. 136099

To Whom It May Concern:

Please find the revised Section 5 of Marshall Miller & Associates' source swap out procedure document provided to your office for the above-referenced radioactive materials license amendment request.

Please call me if you have any questions or require additional information

Sincerely,


Justin S. Douthat, P.E.
Radiation Safety Officer

136099
NUCLEAR MATERIALS-002

5. Risk Estimates to Personnel Involved with Source Procedures

The following are calculations of the projected radiation doses to the personnel involved both directly and indirectly with these operations involving radioactive material. All exposure estimates were made using lengths of tools, distances to shield, et cetera, and known source factors. (gamma-ray constant, activity, et cetera)

Assumptions used in dose calculations

Source type 1 is Gulf Nuclear VL-1 ^{137}Cs 125 mCi in ~1978 \rightarrow 67.2 mCi in 2005

Source type 2 is Isotope Products Labs Model A3015 ^{137}Cs 125 mCi in ~1978 \rightarrow 67.2 mCi in 2005

1. For ^{137}Cs $\Gamma = 3.32 \frac{R - \text{cm}^2}{\text{hr} - \text{mCi}} @ 1\text{cm}$
2. For the Gulf Nuclear VL-1 at ~68 mCi Exposure = $225 \frac{R - \text{cm}^2}{\text{hr}} @ 1\text{cm}$
3. For the IPL Model A3015 at ~200 mCi Exposure = $664 \frac{R - \text{cm}^2}{\text{hr}} @ 1\text{cm}$
4. Distance from hands to source is 12" (~30.5 cm). Inverse-square factor is 1.08×10^{-3}
5. Distance from work bench to eyes is 52 cm Inverse-square factor is 3.69×10^{-4}
6. Lead glass provides ~1 HVL attenuation (6.5 mm Pb equivalence) Attenuation factor is 0.5
7. **Total attenuation/inverse-square factor for lens dose calculation is 1.89×10^{-4}**
8. **Total inverse-square factor for extremity dose calculation is 1.08×10^{-4}**
9. The front of L-block will have 2" Pb bricks in the front forming a "U" shape around the source work area. This is roughly 8 HVL's for ^{137}Cs . The dose to the whole body will be proportional to the lens dose.

Operations involving sources

1. There will be three total operations involving the A3015 sources. Estimated time each is 2 minutes for a total of 6 minutes source handling time.
2. There will be 6 sources to unload from holders to consolidate to 3 holders containing two sources each. Each combination is estimated to take 5 minutes for a total of 15 minutes source handling time.

Source Exposure Calculations

Hands (extremities)

$$IPL(A3015)200mCi * 3.32 \frac{R - cm^2}{hr - mCi} @ 1cm * \left(\frac{1hour}{60 min.s} \right) * 1.08 \times 10^{-3} * 6 min \approx 72mrem$$

$$Gulf(VL-1)67.2mCi * 3.32 \frac{R - cm^2}{hr - mCi} @ 1cm * \left(\frac{1hour}{60 min.s} \right) * 1.08 \times 10^{-3} * 15 min \approx 60.mrem$$

$$\sum \frac{132mrem}{cm^2} \text{ total dose to hands (extremities)}$$

Lens (eye equivalent)

$$IPL(A3015)200mCi * 3.32 \frac{R - cm^2}{hr - mCi} @ 1cm * \left(\frac{1hour}{60 min.s} \right) * 1.89 \times 10^{-4} * 6 min \approx 13mrem$$

$$Gulf(VL-1)67.2mCi * 3.32 \frac{R - cm^2}{hr - mCi} @ 1cm * \left(\frac{1hour}{60 min.s} \right) * 1.89 \times 10^{-4} * 15 min \approx 11mrem$$

$$\sum \frac{23mrem}{cm^2} \text{ total dose to lens (eye equivalent)}$$

Using the above assumptions we have calculated that the Dr. Anthony's total dose to the lens of the eye will be about 23 mrem and the dose to the extremities/hands should

be around 132 mrem. Both Dr. Anthony and Mr. Nunn are fully aware of the associated risks from this procedure and have agreed to perform the above procedure.

The other personnel involved (e.g. other logging supervisors) should receive radiation exposures that are commensurate with those they receive during normal operations.