KERR-McGEE NUCLEAR CORPORATION
KERR-McGEE CENTER • OKLAHOMA CITY, OKLAHOMA 73125

September 30, 1976


Glen D. Brown, Chief
Radiological and Environmental Protection Branch
U.S. Nuclear Regulatory Commission
Office of Inspection and Enforcement
Region IV
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76012

Dear Mr. Brown:

Please refer to our conversations and the telegram sent to your office September 24 regarding a $UF_6$ release at Kerr-McGee Nuclear Corporation's Sequoyah Facility.

In answer to several requests to Mr. C. A. Grosclaude, Manager of Health Physics and Industrial Safety at Sequoyah, we have calculated the exposure of the employee most involved in this release. This calculation is based upon the measurement of Uranium excreted by the employee and the graphically determined biological half-life of this particular employee. This method of estimation was employed since the exact pattern of the employee movements and use of an approved respirator could not be established.

The calculated exposure is .019 of 40 MPC hours. As I stated to you at the time I reported the incident, we did not believe this was a case of over exposure but rather you were being notified in the event some publicity resulted. The data for the calculation, the results and the procedure is given in the attachment to this letter.

Please let me know if additional information is required.

Sincerely yours,

W. J. Shelley, Director
Regulation and Control

WJS:ml

Attachment



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ATTACHMENT

Kerr-McGee Nuclear Corporation
License Sub-1010

Operator $UF_6$ Exposure

September 24, 1976

1. Urine Excretion Data

| | | |
|---|---|---|
| 9/24/76 | 1440 hrs. | 387 µgm/1 |
| 9/24/76 | 2120 hrs. | 274 µgm/1 |
| 9/25/76 | 0430 hrs. | 108 µgm/1 |
| 9/25/76 | 0700 hrs. | 62 µgm/1 |
| 9/26/76 | 0700 hrs. | 17 µgm/1 |

2. Calculation of 24-hour Excretion Rate

| Time | | Ave. Conc. µgm/1 (U) | Volume of Urine Excreted (1) | Total µgm Uranium Excreted |
|---|---|---|---|---|
| 1440 (9/24) | 1640 | 387 | 0.116 | 44.9 |
| 1640 | 1840 | 250 | " | 29. |
| 1840 | 2040 | 200 | " | 23.2 |
| 2040 | 2240 | 160 | " | 18.6 |
| 2240 | 0040 (9/25) | 130 | " | 15.1 |
| 0040 | 0240 | 100 | " | 11.6 |
| 0240 | 0440 | 80 | " | 9.3 |
| 0440 | 0640 | 65 | " | 7.5 |
| 0640 | 0840 | 55 | " | 6.4 |
| 0840 | 1040 | 48 | " | 5.6 |
| 1040 | 1240 | 43 | " | 5.0 |
| 1240 | 1440 | 38 | " | 4.4 |
| | | | TOTAL | 180.6 (24 hrs.) |

A semi-log plot of concentration excreted versus time provides a biological half-life for this operator of 7 hours. From this half-life, it is estimated that in 24 hours, 90% of intake has been excreted resulting in a total estimated intake of 200 µgm divided by 50 $M^3$ (the air volume inhaled by a standard man during 40 hours of work) results in a concentration of 4 µgm per $M^3$ or the fraction 4/303 = .019 of a 40 MPC hour exposure.

MPC = $7 \times 10^{-11}$

Deposited 3.87E mg/m

PROCEDURE FOR ESTIMATING AIRBORNE EXPOSURE

Use this procedure if several but not all urine voidings are collected during the 24-hour period immediately following the exposure.

1. Plot urinary uranium excretion data on semi-log graph paper and determine biological half-life from plotted data.

2. Using urinary excretion rate of 1.4 l/da or 0.058 l/hr for standard man, tabulate urinary uranium concentration (µg/l) determined at midpoints of two (2) hour periods of 24-hour plot along with assumed excretion volume of 0.116(l).

3. Multiply urinary uranium concentration by 0.116(l) for each 2-hour period to determine µg uranium excreted during each 2-hour period.

4. Sum µg values of each 2-hour period to determine total µg of uranium excreted during 24 hours following exposure.

5. Divide total µg of uranium excreted by appropriate 24-hour excretion fraction for exhibited half-life to determine total µg intake. 24-hour excretion fractions for typical half-life values:

| Half-life (da) | Fraction |
|---|---|
| 4 | 0.98 |
| 5 | 0.96 |
| 6 | 0.94 |
| 7 | 0.90 |
| 8 | 0.88 |

6. Determine what fraction of a 40 MPC-hour exposure an intake represents, divide the total µg intake by 40 $M^3$ (the air volume inhaled by a standard man during 40 hours of work) and divide the resulting $\mu g/M^3$ by 303 $\mu g/M^3$ which equals $7 \times 10^{-11}$ $\mu Ci/ml_{air}$ the MPC for soluble natural uranium.

error

S.A. $3.3 \times 10^{-7}$ µci/µg

303 → 103 µg/$m^3$