



DEPARTMENT OF THE AIR FORCE
AIR FORCE INSTITUTE FOR OPERATIONAL HEALTH (AFMC)
BROOKS CITY-BASE TEXAS

9 Dec 2005

MEMORANDUM FOR 75 ABW/CC
7285 4TH STREET BLDG 180
HILL AFB UT 84056-5206

FROM: AFIOH/SDR
2350 Gillingham Drive
Brooks City-Base, TX 78235-5103

SUBJECT: Consultative Letter, IOH-SD-BR-CL-2005- 0089, Long-Term Radon Monitoring due to Past Luminous Paint Operations at Building 214, Hill AFB UT

1. **INTRODUCTION:** HQ USAF/SG directed the Air Force Institute for Operational Health, Radiation Surveillance Division (AFIOH/SDR) to investigate potential radiation exposures to personnel working in and around buildings which historically were involved with luminescent dial painting operations. These operations involved the use of radium (^{226}Ra) based paints. Building 214 at Hill AFB UT Radium/Radon Monitoring and Dose Assessment Due to Past Luminous Paint Operations at Hill AFB was identified as one such location. The objective was to ensure compliance with radiation exposure limits set by Air Force Instruction (AFI) 48-148, *Ionizing Radiation Protection*. In November 2003, AFIOH/SDR evaluated internal and external radiation exposure pathways due to radon concentrations inside building 214 at Hill AFB using short term methods and, at that time, deployed long-term alpha track monitors to determine the building's average annual radon concentration (results reported in Consultative Letter IOH-SD-SR-CL-2004-0002, Radium/Radon Monitoring and Dose Assessment Due to Past Luminous Paint Operations at Hill AFB UT, 08 Feb 04). The long-term detectors were collected in December 2004 and, consistent with the short-term results, all results for building 214 are below the recommended radon action level of 4.0 pCi/L. Since building 214 meets the goal of the Air Force Radon Assessment and Mitigation Program (RAMP) and complies with AFI 48-148, no further radon monitoring and no radon mitigation is required. Recommendations are provided in Section 6 of this consultative letter regarding the control of any potential future hazard in this facility.

2. **BACKGROUND:** Historical instrument repair and painting operations in building 214 involved the use of, or exposure to, luminous paint which contained the radioactive material ^{226}Ra . Radon-222 (^{222}Rn) is a naturally-occurring, radioactive gas that is produced by the decay of the ^{226}Ra . Sampling in similar facilities at other Air Force locations confirmed expected residual radioactivity from radium and associated radioactive decay products in areas such as exhaust ventilations systems, waste drains, and floors.

3. INSTRUMENTATION AND METHODS:

a. Internal Exposure Assessment: In November 2003, alpha track monitors were deployed at various locations to measure the average annual radon concentration. In December 2004, 25 monitors were collected and sent to Radiation Safety Services Incorporated (RSSI) for processing. See Attachment 1 for individual alpha track results.

b. Background Determination: Areas within building 214 where residual radioactivity was neither expected nor detected were sampled for background radon.

4. RESULTS: 25 alpha track monitors were collected from building 214 and analyzed. 18 of those were from areas with detected residual radioactivity and 7 were from background locations. The average radon concentration in areas of residual radioactivity was 0.3 ± 0.9 pCi/L and that in the background areas was 0.6 ± 0.8 pCi/L.

5. CONCLUSIONS: Hill AFB is located in EPA Zone 2 (<http://www.epa.gov/radon/zonemap.html>) and average background radon concentrations in this zone are expected to range between 2.0 pCi/L and 4.0 pCi/L in unmitigated buildings. Historical RAMP data for Hill AFB from 1987 to 1990 exhibits a radon concentration range from 0.4 to 2.2 pCi/L with a geometric mean of 1.1 pCi/L. Since the average annual concentration in building 214 is below the recommended action level of 4.0 pCi/L, mitigation is not required IAW AFI 48-148.

6. RECOMMENDATIONS:

a. Ensure continued compliance with the recommendation made in Consultative Letter IOH-SD-SR-CL-2004-0002, Radium/Radon Monitoring and Dose Assessment Due to Past Luminous Paint Operations at Hill AFB UT 08 Feb 04, regarding the control of the residual radioactivity.

b. Conduct a radon concentration survey after any major changes in building occupancy, ventilation rates, or outside access ways (doors and windows).

c. Before, during, and after any intrusive activities in the impacted areas, perform operational risk management through the use of radiation survey instruments, environmental sampling, personnel dosimeters, and bioassays.

d. If further guidance is needed on environmental investigations, radiological remediation efforts, or radioactive waste disposal, please contact the Health Physics Consulting Branch (AFIOH/SDRH) at DSN 240-3486.

7. If you have any questions or need further assistance, please contact 1Lt James Fyffe via email at james.fyffe@brooks.af.mil or at DSN 240-8508, (210) 536-8508 or the ESOH Service Center at 1-888-232-ESOH.

//signed//

SCOTT M. NICHELSON, Lt Col, USAF, BSC, CHP, CIH
Chief, Radiation Surveillance Division

Attachment:
Alpha track results

cc:
AFMSA/SGPR
HQ AFMC/SGPB
75 AMDS/SGPB
AFRPA/EV
HQ AFMC/CEV
HQ USAF/ILEV



6312 West Oakton Street
Morton Grove, IL 60053-2723
847-965-1999
Fax 847-965-1991

December 22, 2004

BROOKS AIR FORCE BASE
ATTN: MAJOR BIAS
AFIOH/SDR
2350 GILLINGHAM DRIVE
CITY BASE, TX 78235

Monitor Number	pCi/l	Test Location	Exposure Start	Exposure End Date	Reprint from
149676	0.6	HILL AFB	11/11/03	12/13/04	12/22/04
149677	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
149681	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
149682	0.4	HILL AFB	11/11/03	12/13/04	12/22/04
149685	0.7	HILL AFB	11/11/03	12/13/04	12/22/04
149691	0.6	HILL AFB	11/11/03	12/13/04	12/22/04
149692	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
149697	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
149698	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
149708	0.5	HILL AFB	11/11/03	12/13/04	12/22/04
149709	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
149710	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
150203	0.5	HILL AFB	11/11/03	12/13/04	12/22/04
150204	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
150208	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
150209	0.7	HILL AFB	11/11/03	12/13/04	12/22/04
150210	0.6	HILL AFB	11/11/03	12/13/04	12/22/04
150212	0.3	HILL AFB	11/11/03	12/13/04	12/22/04

Continued



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Monitor Number	pCi/l	Test Location	Exposure Start	Exposure End Date	Reprint from
150213	0.4	HILL AFB	11/11/03	12/13/04	12/22/04
150214	0.3	HILL AFB BROKEN	11/13/03	12/13/04	12/22/04
150216	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
150217	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
150218	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
150219	0.3	HILL AFB	11/11/03	12/13/04	12/22/04
150224	0.7	HILL AFB	11/11/03	12/13/04	12/22/04