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

9 Dec 2005

MEMORANDUM FOR 92 ARW/CC
1 EAST BONG STREET SUITE 206
FAIRCHILD AFB WA 99011

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

SUBJECT: Consultative Letter, IOH-SD-BR-CL-2005-0086, Long-Term Radon Monitoring due to Past Luminous Paint Operations at Building 2120, Fairchild AFB WA

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 2120 at Fairchild AFB WA 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 2120 at Fairchild 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-BR-CL-2004-0001, Radium/Radon Monitoring and Dose Assessment Due to Past Luminous Paint Operations at Fairchild AFB, 08 Feb 04). The long-term detectors were collected in November 2004 and, consistent with the short-term results, all results for building 2120 are below the recommended radon action level of 4.0 pCi/L. Since building 2120 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 2120 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.

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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 November 2004, 40 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 2120 where residual radioactivity was neither expected nor detected were sampled for background radon.

4. RESULTS: 40 alpha track monitors were collected from building 2120 and analyzed. 35 of those were from areas with detected residual radioactivity and 5 were from background locations. The average radon concentration in areas of residual radioactivity was 0.5 ± 0.2 pCi/L and that in the background areas was 0.1 ± 0.0 pCi/L.

5. CONCLUSIONS: Fairchild AFB is located in EPA Zone 1 (http://www.epa.gov/radon/zonemap.html) and average background radon concentrations in this zone are expected to exceed 4.0 pCi/L in unmitigated buildings. Historical RAMP data for Fairchild AFB from 1987 to 1990 exhibits a radon concentration range from 0.1 to 8.2 pCi/L with a geometric mean of 0.9 pCi/L. Since the average annual concentration in building 2120 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-BR-CL-2004-0001, Radium/Radon Monitoring and Dose Assessment Due to Past Luminous Paint Operations at Fairchild AFB, 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
AFRPA/EV
92 ADS/SGGB
HQ AMC/SGPB
HQ AMC/CEV
HQ USAF/ILEV

RSSI

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

Monitor Number	pCi/l	Test Location	Exposure Start	Exposure End Date	Reprint from
149596	0.3	FAIRCHILD AFB	11/04/03	11/24/04	
149597	0.5	FAIRCHILD AFB	11/04/03	11/24/04	
149598	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149599	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149600	0.3	FAIRCHILD AFB	11/04/03	11/24/04	
149777	0.4	FAIRCHILD AFB	11/05/03	11/24/04	
149778	0.4	FAIRCHILD AFB	11/05/03	11/24/04	
149786	0.9	FAIRCHILD AFB	11/05/03	11/24/04	
149788	0.7	FAIRCHILD AFB	11/05/03	11/24/04	
149789	0.7	FAIRCHILD AFB	11/05/03	11/24/04	
149790	1.4	FAIRCHILD AFB	11/05/03	11/24/04	
149791	0.7	FAIRCHILD AFB	11/05/03	11/24/04	
149792	0.7	FAIRCHILD AFB	11/05/03	11/24/04	
149793	0.7	FAIRCHILD AFB	11/05/03	11/24/04	

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RSSI

6312 West Oakton Street
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847-965-1999
Fax 847-965-1991

December 8, 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
149577	0.3	FAIRCHILD AFB	11/04/03	11/24/04	
149578	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149579	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149580	0.3	FAIRCHILD AFB	11/04/03	11/24/04	
149581	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149582	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149583	0.3	FAIRCHILD AFB	11/04/03	11/24/04	
149584	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149585	0.5	FAIRCHILD AFB	11/04/03	11/24/04	
149587	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149588	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149589	0.6	FAIRCHILD AFB	11/04/03	11/24/04	
149590	0.3	FAIRCHILD AFB	11/04/03	11/24/04	
149591	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149592	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
149593	0.3	FAIRCHILD AFB	11/04/03	11/24/04	
149594	0.3	FAIRCHILD AFB	11/04/03	11/24/04	
149595	0.3	FAIRCHILD AFB	11/04/03	11/24/04	

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RSSI

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Monitor Number	pCi/l	Test Location	Exposure Start	Exposure End Date	Reprint from
150198	0.4	FAIRCHILD AFB	11/04/03	11/24/04	
150199	0.3	FAIRCHILD AFB	11/04/03	11/24/04	
150239	0.1	FAIRCHILD AFB	11/04/03	11/24/04	
150285	0.1	FAIRCHILD AFB	11/04/03	11/24/04	
150295	0.1	FAIRCHILD AFB	11/04/03	11/24/04	
150298	0.1	FAIRCHILD AFB	11/04/03	11/24/04	
150299	0.1	FAIRCHILD AFB	11/04/03	11/24/04	

RSSI

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

December 29, 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
149794	0.7	FAIRCHILD	11/05/03	12/14/04	

WHAT YOUR TEST RESULTS MEAN

The average indoor radon level in homes is estimated by the US EPA to be below 2 pCi/l. About 0.4 pCi/l is normally found in outside air. Congress has set a long-term goal that indoor radon levels be no more than outdoor levels. While this goal is not yet technologically achievable in all cases, the radon concentration in most homes with elevated concentrations *can* be reduced to below 2 pCi/l. However, US EPA believes that any radon exposure carries some risk. No level of radon is safe and you can reduce your risk of lung cancer by lowering your radon exposure. If your living patterns change and you begin occupying a level of your home lower than the level on which you have tested, you should retest your home on that lower level. Also, radon concentrations fluctuate daily, seasonally, and with weather conditions. This alpha track monitor provides the best averaging for these fluctuations. Therefore, you may wish to test again for a full year to average seasonal fluctuations or if exposure was for less than 90 days.