



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

27 Dec 2005

MEMORANDUM FOR DR. DONALD HANSON, DIRECTOR  
AIR FORCE RESEARCH LABORATORY  
26 ELECTRONICS PARKWAY  
ROME NY 13441-4514

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

SUBJECT: Consultative Letter, IOH-SD-BR-CL-2005-0092, Long-Term Radon Monitoring due to Past Luminous Paint Operations at Building 104, Rome Research Site, Rome, NY (Former Griffiss Air Force Base)

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 ( $^{226}\text{Ra}$ ) based paints. Building 104 at the Rome Research Site NY 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 October 2003, AFIOH/SDR evaluated internal and external radiation exposure pathways due to radon concentrations inside building 104 at the Rome Research Site 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 Rome Research Site, Rome, NY (Former Griffiss Air Force Base), 08 Feb 04). The long-term detectors were collected in November 2004 and, consistent with the short-term results, all results for building 104 are below the recommended radon action level of 4.0 pCi/L. Since building 104 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. Results from building 102, however, which was chosen to monitor background levels of radon, indicate elevated levels of radon at 6.6 pCi/L. 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 104 involved the use of, or exposure to, luminous paint which contained the radioactive material  $^{226}\text{Ra}$ . Radon-222 ( $^{222}\text{Rn}$ ) is a naturally-occurring, radioactive gas that is produced by the decay

of the <sup>226</sup>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 October 2003, alpha track monitors were deployed at various locations to measure the average annual radon concentration. In November 2004, 41 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 102 where residual radioactivity was neither expected nor detected were sampled for background radon.

4. RESULTS: 41 alpha track monitors were collected and analyzed from building 104 and 102. 27 of those were from areas in building 104 with detected residual radioactivity and 14 were in building 102 for background measurements. The average radon concentration in building 104 was  $0.7 \pm 0.7$  pCi/L and that in building 102 was  $6.6 \pm 1.4$  pCi/L.

5. CONCLUSIONS: Rome 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 the Rome Research Site (formerly Griffiss AFB) from 1988 to 1990 exhibits a radon concentration range from 0.1 to 9.8 pCi/L with a geometric mean of 0.7 pCi/L. Since the background radon concentrations in building 102 exceed the radon concentrations in the test areas of building 104, the indoor radon is assumed to be primarily naturally occurring. As such, removal or remediation of the residual radioactivity from radium may not significantly lower the building's average annual concentration of 0.7 pCi/L. Since the average annual concentration in building 104 is below the recommended action level of 4.0 pCi/L, mitigation is not required IAW AFI 48-148. The average annual concentration in building 102, however, is well above the action level of 4.0 pCi/L. AFI 48-148 section 5.3.1.1.3 requires that this building be remediated within 1-3 years. Building 102 needs to be reassessed by the installation RSO for ambient radon concentrations no less than two weeks and no greater than 6 months after the completion of remedial efforts to validate the efficacy of the remedial action. This should consist of a combination of short-term and long-term monitoring to assure that acceptable radon levels have been achieved.

### 6. RECOMMENDATIONS:

a. Improve ventilation in building 102 in order to draw in more fresh air rather and reduce the re-circulation of existing air.

b. Ensure continued compliance with the recommendation made in Consultative Letter IOH-SD-BR-CL-2004-0004, Radium/Radon Monitoring and Dose Assessment Due to Past Luminous Paint Operations at Rome Research Site, Rome, NY (Former Griffiss Air Force Base, 08 Feb 04, regarding the control of the residual radioactivity.

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

d. 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.

e. 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](mailto: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:

1. Alpha track reports
2. Alpha track locations

cc:

AFMSA/SGPR

AFRPA/EV

AFRPA/DA (Mr. James Waldron)

AFRL/IFOCVB (Mr. Bruce Mero)

AFRL/SNRD (Lt Christopher Geisel)



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
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150171	0.4	AFRL	10/29/03	11/16/04	
150178	7.6	AFRL	10/29/03	12/01/04	
150181	6.2	AFRL	10/29/03	12/01/04	
150183	9.0	AFRL	10/29/03	12/01/04	
150184	6.3	AFRL	10/29/03	12/01/04	
150185	6.7	AFRL	10/29/03	12/01/04	
150187	5.5	AFRL	10/29/03	12/01/04	
150188	7.8	AFRL	10/29/03	12/01/04	
150189	4.3	AFRL	10/29/03	12/01/04	

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Monitor Number	pCi/l	Test Location	Exposure Start	Exposure End Date	Reprint from
150173	0.6	AFRL	10/29/03	11/19/04	
150174	0.5	AFRL	10/29/03	11/19/04	
150175	0.3	AFRL	10/29/03	11/19/04	
150176	0.4	AFRL	10/29/03	11/19/04	
150177	0.4	AFRL	10/29/03	11/19/04	



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Monitor Number	pCi/l	Test Location	Exposure Start	Exposure End Date	Reprint from
150190	5.7	AFRL	10/29/03	12/01/04	
150193	0.1	AFRL	10/29/03	11/16/04	
150194	0.1	AFRL	10/29/03	11/16/04	
150195	0.1	AFRL	10/29/03	11/16/04	
150196	0.1	AFRL	10/29/03	11/16/04	
150197	0.1	AFRL	10/29/03	11/16/04	



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Monitor Number	pCi/l	Test Location	Exposure Start	Exposure End Date	Reprint from
150151	0.4	AFRL	10/29/03	11/19/04	
150152	0.4	AFRL	10/29/03	11/19/04	
150153	0.4	AFRL	10/29/03	11/19/04	
150154	1.0	AFRL	10/29/03	11/19/04	
150155	1.7	AFRL	10/29/03	11/19/04	
150156	1.2	AFRL	10/29/03	11/19/04	
150157	0.4	AFRL	10/29/03	11/19/04	
150158	0.4	AFRL	10/29/03	11/19/04	
150159	0.3	AFRL	10/29/03	11/19/04	
150160	0.4	AFRL	10/29/03	11/19/04	
150161	0.4	AFRL	10/29/03	11/19/04	
150162	0.4	AFRL	10/29/03	11/19/04	
150163	0.5	AFRL	10/29/03	11/19/04	
150164	0.3	AFRL	10/29/03	11/19/04	
150165	0.6	AFRL	10/29/03	11/19/04	
150166	0.4	AFRL	12/29/03	11/19/04	
150167	0.4	AFRL	10/29/03	11/19/04	
150168	0.4	AFRL	10/29/03	11/19/04	
150169	0.3	AFRL	10/29/03	11/19/04	
150170	0.5	AFRL	10/29/03	11/19/04	
150172	0.6	AFRL	10/29/03	11/19/04	

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**ATTACHMENT 2 - Alpha Track Locations**

<b>Building 104 (AFRL)</b>			
<b>Serial #</b>	<b>StartTest</b>	<b>Location Bldg/Rm</b>	<b>Comments/Location in Room</b>
150151	10/29/2003	104/30	Sprinkler Center of Rm
150152	10/29/2003	104/29	Conduit Front of Rm
150153	10/29/2003	104/01	In Closet on Pipe
150154	10/29/2003	104/32	Bar Near Right Wall
150155	10/29/2003	104/35	Right of Sink
150156	10/29/2003	104/39	Under Shelf Conduit Left Side
150157	10/29/2003	104/22	Above Power Panel Far Right Side
150158	10/29/2003	104/21	Under Bench Shelf Front
150159	10/29/2003	104/40	Under Shelf Conduit Right Side
150160	10/29/2003	104/41	Right Side Power Panel
150161	10/29/2003	104/20	Right Side Conduit
150163	10/29/2003	104/17	Emergency Light
150164	10/29/2003	104/18	Emergency Light
150165	10/29/2003	104/14	Emergency Light
150166	10/29/2003	104/11	Emergency Light
150167	10/29/2003	104/5	Wall Column
150168	10/29/2003	104/6	Wall Column
150169	10/29/2003	104/10	Emergency Light
150170	10/29/2003	104/37	Ceiling Conduit
150172	10/29/2003	104/24	Door Frame
150173	10/29/2003	104/2	Wall Column
150174	10/29/2003	104/37	Overhead Phone Line
150175	10/29/2003	104/25	Emergency Light Conduit
150176	10/29/2003	104/26	Emergency Light Conduit
150177	10/29/2003	104/16	Emergency Light Conduit
160162	10/29/2003	104/19	Cabinet Inside Door

**Building 102 (NEADS)**

<b>Serial #</b>	<b>StartTest</b>	<b>Location Bldg/Rm</b>	<b>Comments/Location in Room</b>
150178	10/29/2003	102/135	On Wall
150179	10/29/2003	102/137	Janitor's Closet Conduit
150180	10/29/2003	102/126	NBC Office
150181	10/29/2003	102/120	Outside Wall
150182	10/29/2003	102/132	Outside Wall
150183	10/29/2003	102/141	Outside Wall
150184	10/29/2003	102/142	On Wall Near Fire Alarm
150185	10/29/2003	102/149	Near Window
150186	10/29/2003	102/161	Restroom
150187	10/29/2003	102/106	Compliance/Historian Room
150188	10/29/2003	102/112	Gym
150189	10/29/2003	102/113	Steam Room
150190	10/29/2003	102/111	Men's Room