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14. ABSTRACT A radon study was performed post-remediation to determine if the ambient levels present in Building 54 at Nellis AFB are greater than Air Force standards. Per AFI 48-148, Ionizing Radiation Protection, 21 September 2011, paragraph 5.3.1.1.3, the data from this study were used to determine if facilities must be mitigated for radon hazards. No results from this study were above the 4.0 pCi/L action level.					
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DEPARTMENT OF THE AIR FORCE
USAF SCHOOL OF AEROSPACE MEDICINE (AFMC)
WRIGHT-PATTERSON AFB, OHIO

13 July 2012

MEMORANDUM FOR ACC 99 AMDS/SGPB
ATTN: SSGT MARIGOLD WESTBROOK
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NELLIS AFB, NV 89191

FROM: USAFSAM/OEHHH
2510 Fifth Street
Wright-Patterson AFB, OH 45433-7913

SUBJECT: Consultative Letter, AFRL-SA-WP-CL-2012-0060, Radon Sampling, Building 54,
Nellis AFB, NV

1. OVERVIEW: A radon study was performed post-remediation to determine if the ambient levels present in Building 54 at Nellis AFB are greater than Air Force standards. Per AFI 48-148, *Ionizing Radiation Protection*, 21 September 2011, paragraph 5.3.1.1.3, the data from this study will be used to determine if facilities must be mitigated for radon hazards (Attachments 1 and 2).

2. INTRODUCTION: The Nellis AFB Bioenvironmental Engineering Flight (BEF) performed radon testing in response to a concern of elevated radon levels in Building 54. The building was previously remediated to reduce the radon concentration in 2011. Two radon detectors were used by the BEF to retest this facility over a period of 2 days to ensure the mitigation was successful. This study was performed in accordance with USAF policy as outlined in the Radon Assessment and Mitigation Program and AFI 48-148.

3. TESTING METHODOLOGY:

a. *Test Scenario*: Building 54 was chosen to test for radon gas levels. Radon detectors were placed in the test locations on 22 Mar 12 and collected 24 Mar 12.

b. *Detection Equipment*: The facility was tested using the E-Perm system from Rad Elec Inc. This passive radon measurement system contains a charged Teflon disk that serves as both an electrostatic field and sensor. Radon gas that passively enters the chamber will emit alpha-particles that ionize air molecules. These ions are then collected by the electret, causing a reduction of its surface charge. The reduction of the charge on the electret is directly measured and used to calculate actual radon levels. Short-term electrets were placed in S-Chambers for a short-term test of two days (Figure 1). This short-term combination is referenced as the SST configuration by Rad Elec Inc.



Figure 1. Rad Elec Inc., E-Perm System

c. *Calculations:* Equation 1 below illustrates how radon levels are calculated using the starting and ending voltages of the E-Perm electret. Constants are utilized in the calculations based on the E-Perm configuration.

$$\text{RadonConcentration}(pCi / L) = \left(\frac{(I - F)}{CF_A \times D} - BG \right) \times CF_B \quad (1)$$

Where:

I = initial voltage of electret

F = final voltage of electret

D = exposure duration in days

$CF_A = A + B \times (I + F)/2$

BG = gamma background ($\mu R / h$) x constant-G

CF_B =elevation correction factor of 1.00 for the SST was used for these calculations

Constants for SST configuration:

A = 1.69776

B = 0.0005742

G = 0.087

d. *Gamma Background:* The BEF measured the gamma background for this facility at 11.0 $\mu R / h$ with an Invision Model 451P survey meter, serial number 4300, calibration date 22 Nov 11. This value is utilized in the calculations in Section 3.c. of this report.

4. **RESULTS:** No results from this study were above the 4.0 pCi/L action level. Detector SAV554 and SAV947 had results of 3.6 pCi/L and 2.8 pCi/L, respectively.

5. CONCLUSIONS AND RECOMMENDATIONS: The results from this post-remediation study are below the action level of 4 pCi/L; therefore, no further action is required.

6. If you have questions regarding this report, please contact Ms. Piper Williams at piper.williams@wpafb.af.mil or DSN 798-3321, commercial 937-938-3321.

A handwritten signature in blue ink, appearing to read "David M. Sonntag". The signature is stylized with a large initial "D" and a long, sweeping underline.

DAVID M. SONNTAG, Lt Col, USAF, BSC
Chief, Risk Analysis

2 Attachments:

1. Survey Checklist (Filled out by Nellis BEF)
2. Notice to Occupant (Filled out by Nellis BEF)

Attachment 2. Survey Checklist

[illegible]

Attachment 2
Notice to Occupant (Filled out by Nellis BEF)

Attachment 3. Notice to Occupant

Notice to Tenant.

This detector has been placed to monitor for radon gas. It must remain in place for approximately 90 days. At the end of this time you will be asked to close the chamber by screwing down the cap and documenting the date and time that this action was completed. This device should be returned to your local Bio Environmental Engineering Flight immediately after it has been closed. Bio Environmental can be contacted with any questions you may have.



Figure A3-1. S-Chamber (Closed chamber on Left, open on the right)

(SAV 554) 1548

Date Chamber was opened 21 Mar 2012 Time Chamber was opened 1550 (SAV 947)
Recommended Date for return _____ (+90 days from time of opening)
Date Chamber was closed 23 MAR 12 Time Chamber was Closed SAV 554 - 1350
SAV 947 - 1352

Bio Environmental POC:

Name: Capt David Wooten

Phone Number: 348-33218/3316

P 451 used
S/N (A) M 155540