

U. S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket No.: 030-09859 (terminated)

License No.: 45-10085-03 (terminated)

Report No.: 45-10085-04/96-01

Licensee: Roanoke College

Location: 221 College Lane
Salem, Virginia

Date: December 19, 1996

Inspectors: John M. Pelchat, Health Physicist

Approved by: Thomas R. Decker, Acting Chief
Materials Licensing and Inspection Branch 1
Division of Nuclear Materials Safety

Enclosure

EXECUTIVE SUMMARY

Roanoke College
NRC Inspection Report No. 45-10085-03/96-01

This routine, announced inspection was conducted to evaluate the current radiological status of Rooms 176, 177A, 177B, 178, 179, and 462 in Trexler Hall, formerly utilized for licensed activities by the licensee located at 221 College Lane, Roanoke, Virginia. The rooms had been used in the 1970s' for various experiments using radioactive materials. In about 1994, Roanoke College refurbished some of these areas for new research and teaching activities. One unrefurbished laboratory remains in use as a laboratory, one is in use as a lounge and the others are in use as storage areas. The purpose of this inspection was to obtain confirmatory measurements that could be used to verify the readiness of these five rooms for release to unrestricted use. The conduct of this inspection included discussions with cognizant licensee representatives, reviews of documents, and direct observations and radiological surveys of the site.

Licensee's Final Survey Report

The inspector reviewed the licensee's letter dated August 14, 1996. This letter indicated no record existed concerning the decommissioning of the five rooms in Trexler Hall. Licensed activities carried out under this license were terminated in about 1975 when the authorized user left the college. The licensee contacted this individual to develop information concerning the specific activities that took place. The results of the licensee's investigation were documented in the letter dated August 14, 1996. Licensed activities consisted of the neutron activation of small sources for use in sputtering experiments. The sources all had an initial activity of less than one millicurie. The longest lived radioisotope produced was reportedly cobalt 57 (Co-57) with a half-life of 270 days.

Disposition of Materials

The inspector determined that no licensed materials were stored in Rooms 176, 177A, 177B, 178, 179, and 462 in Trexler Hall. Two small vials containing small quantities of uranium ore were found in Room 462. Possession of this material is exempt in accordance with 10 CFR 40.13(a). While no specific information is available concerning the disposition of licensed materials, any remaining activity will have decayed to background levels. Calculations by the inspector indicated that a one millicurie Co-57 source produced in December 1975 would have decayed to less than 8.0×10^{-9} millicuries as of the date of the inspection.

Confirmatory Surveys

The inspector obtained fixed contamination measurements, removable contamination samples, dose rate measurements in each of the areas that the licensee's representatives indicated were used for the handling or storage of licensed materials. The results of the fixed and removable

contamination surveys and the dose rate measurements indicated that no area exceeded the current unrestricted release criteria.

LIST OF PERSONS CONTACTED

Licensee

F. Murley, Ph.D., Associate Professor, Physics & Radiation Safety Officer
J. Steehler, Ph.D., Associate Professor, Chemistry

REPORT DETAILS

01. Conduct of Confirmatory Survey

The inspector obtained confirmatory measurements in each of the five rooms in which licensed materials were used or stored. The inspector obtained fixed and removable contamination measurements and dose rate measurements from walls, floors, and surviving fixtures.

The inspector performed the survey by first scanning the floor and wall surfaces up to two meters in height with a ratemeter and "pancake" geiger-mueller probe. Floor and wall grids were selected for evaluation and were scanned with the same instrument. Five points were selected in an approximately one square meter grid for measurement. The intent was to include any elevated areas identified during the initial scanning of the grid as one of the five points. No areas of elevated radiation levels were found. In addition, "smear" samples for removable contamination were taken from the point with the highest measured radiation rate in each grid. A dose rate measurement was also obtained at one meter with a sodium iodide scintillation microR meter.

02. Results of Confirmatory Survey

Since Co-57, as well as other mixed beta-gamma emitting nuclides, were the most probable contaminants present, release criteria limits of 5,000 disintegrations per minute per 100 square centimeters (dpm/100 cm²) average and 15,000 dpm/100 cm² maximum for fixed contamination and 1,000 dpm/100 cm² for removable contamination were selected to apply to the facility. The dose rate limit was 5 μ rem/hour above background at one meter above the surface surveyed.

The results of the confirmatory survey are summarized in Table 1, Confirmatory Survey Results. The levels of fixed and removable contamination on the floor surfaces met the release criteria. All of the surveyed wall and floor surfaces met the release criteria.

EXIT MEETING SUMMARY

The inspectors discussed the inspection results with Dr. Munley on December 19, 1996. The inspectors informed Dr. Munley that no areas of contamination exceeding the current release criteria were found in the five rooms surveyed.

INSPECTION PROCEDURES USED

IP 83890: Closeout Inspection and Survey

TABLE 1
CONFIRMATORY SURVEY RESULTS
ROANOKE COLLEGE
DECEMBER 19, 1996

LOCATION (wipe sample no.)	AVERAGE FIXED POINT MEASUREMENT (dpm/100 cm ²)	MAXIMUM FIXED POINT MEASUREMENT (dpm/100 cm ²)	μREM/HOUR ABOVE BACKGROUND AT ONE METER	REMOV- ABLE ALPHA CONTAMI- NATION (dpm/100 cm ²)	REMOV- ABLE BETA- GAMMA CONTAMI- NATION (dpm/100 cm ²)
Room 462					
Fume Hood Apron (1)	< MDA	< MDA	2	< MDA	< MDA
Hood Left Side	< MDA	< MDA	2	-	-
Hood Right Side	< MDA	< MDA	2	-	-
Hood Floor	< MDA	< MDA	2	-	-
Hood Left Wall (2)	< MDA	< MDA	2	< MDA	< MDA
Hood Back Wall (3)	< MDA	< MDA	2	< MDA	< MDA
Hood Right Wall	< MDA	< MDA	2	-	-
Sink at Extreme Right (as viewed from door) (4)	< MDA	< MDA	2	< MDA	< MDA
Sink at Extreme Right Floor (5)	< MDA	< MDA	2	< MDA	12
Center Right Sink (6)	< MDA	< MDA	2	< MDA	11

LOCATION (wipe sample no.)	AVERAGE FIXED POINT MEASUREMENT (dpm/100 cm ²)	MAXIMUM FIXED POINT MEASUREMENT (dpm/100 cm ²)	μREM/HOUR ABOVE BACKGROUND AT ONE METER	REMOV- ABLE ALPHA CONTAMI- NATION (dpm/100 cm ²)	REMOV- ABLE BETA- GAMMA CONTAMI- NATION (dpm/100 cm ²)
Center Right Sink Floor (7)	< MDA	< MDA	2	< MDA	13
Center Left Sink (8)	< MDA	< MDA	3	< MDA	14
Center Left Sink Floor (9)	< MDA	< MDA	2	< MDA	13
Extreme Left Wall Sink (10)	< MDA	< MDA	2	< MDA	16
Extreme Left Wall Sink, Floor (11)	< MDA	< MDA	2	< MDA	13
Sink near door (12)	< MDA	< MDA	2	< MDA	14
Sink near door, floor (13)	< MDA	< MDA	2	< MDA	13
Left wall (as viewed from door)	< MDA	< MDA	2	-	-
Left wall (as viewed from door) (14)	< MDA	< MDA	2	< MDA	13
Left wall (as viewed from door) (15)	< MDA	< MDA	2	< MDA	12

LOCATION (wipe sample no.)	AVERAGE FIXED POINT MEASUREMENT (dpm/100 cm ²)	MAXIMUM FIXED POINT MEASUREMENT (dpm/100 cm ²)	μREM/HOUR ABOVE BACKGROUND AT ONE METER	REMOV- ABLE ALPHA CONTAMI- NATION (dpm/100 cm ²)	REMOV- ABLE BETA- GAMMA CONTAMI- NATION (dpm/100 cm ²)
Left wall (as viewed from door)	< MDA	< MDA	2	-	-
Left wall (as viewed from door)	< MDA	< MDA	2	-	-
Right Wall next to door	< MDA	< MDA	2	-	-
Right Wall next to door	< MDA	< MDA	2	-	-
Right Wall next to door	< MDA	< MDA	2	-	-
Counter next to door	< MDA	< MDA	2	-	-
Counter next to door	< MDA	< MDA	2	-	-
Counter next to door	< MDA	< MDA	2	-	-
Center Counter	< MDA	< MDA	2	-	-
Right Counter	< MDA	< MDA	2	-	-
Air exhaust of fume hood (16)	< MDA	< MDA	2	< MDA	15

LOCATION (wipe sample no.)	AVERAGE FIXED POINT MEASUREMENT (dpm/100 cm ²)	MAXIMUM FIXED POINT MEASUREMENT (dpm/100 cm ²)	μREM/HOUR ABOVE BACKGROUND AT ONE METER	REMOV- ABLE ALPHA CONTAMI- NATION (dpm/100 cm ²)	REMOV- ABLE BETA- GAMMA CONTAMI- NATION (dpm/100 cm ²)
Right Wall	< MDA	< MDA	2	-	-
Right Wall	< MDA	< MDA	2	-	-
Right Wall	< MDA	< MDA	2	-	-
Trexler Room 179 B					
Glass Drain Pipe (17)	< MDA	< MDA	0	< MDA	16
Glass Drain Pipe	< MDA	< MDA	0	-	-
Glass Drain Pipe (18)	< MDA	< MDA	0	< MDA	14
Glass Drain Pipe	< MDA	< MDA	0	-	-
Glass Drain Pipe (19)	< MDA	< MDA	1	< MDA	17
Glass Drain Pipe	< MDA	< MDA	1	-	-
Glass Drain Pipe	< MDA	< MDA	2	-	-
(A) Northeast wall near door (20)	< MDA	< MDA	1	< MDA	13
(B) Floor near mid- point of NE wall (21)	< MDA	< MDA	1	< MDA	16

LOCATION (wipe sample no.)	AVERAGE FIXED POINT MEASUREMENT (dpm/100 cm ²)	MAXIMUM FIXED POINT MEASUREMENT (dpm/100 cm ²)	μREM/HOUR ABOVE BACKGROUND AT ONE METER	REMOV- ABLE ALPHA CONTAMI- NATION (dpm/100 cm ²)	REMOV- ABLE BETA- GAMMA CONTAMI- NATION (dpm/100 cm ²)
(C) Northeast wall near north corner (22)	< MDA	< MDA	1	< MDA	14
(D) Floor near north corner (23)	< MDA	< MDA	1	< MDA	14
(E) Northwest wall near door (27)	< MDA	< MDA	1	< MDA	12
(F) Southwest wall	< MDA	< MDA	2	-	-
(G) Floor near southwest wall (24)	< MDA	< MDA	1	< MDA	11
Shelves along southeast wall (25)	< MDA	< MDA	1	< MDA	15
(H) Shelves along southeast wall (26)	< MDA	< MDA	1	< MDA	12
Trexler Hall Room 179C					
(A) Northeast wall	< MDA	< MDA	1	-	-
(B) Floor near middle of northwest wall	< MDA	< MDA	1	-	-
(C) Southwest wall	< MDA	< MDA	1	-	1

LOCATION (wipe sample no.)	AVERAGE FIXED POINT MEASUREMENT (dpm/100 cm ²)	MAXIMUM FIXED POINT MEASUREMENT (dpm/100 cm ²)	μREM/HOUR ABOVE BACKGROUND AT ONE METER	REMOV- ABLE ALPHA CONTAMI- NATION (dpm/100 cm ²)	REMOV- ABLE BETA- GAMMA CONTAMI- NATION (dpm/100 cm ²)
(D) Floor near south corner (28)	< MDA	< MDA	1	< MDA	15
(E) Southeast wall	< MDA	< MDA	0	-	-
Trexler Hall Room 179A					
(A) Northwest wall (29)	< MDA	< MDA	1	< MDA	11
(B) Floor (30)	< MDA	< MDA	0	< MDA	12
Trexler Hall Room 179					
(A) Northwest wall (31)	< MDA	< MDA	0	< MDA	15
(B) Floor (32)	< MDA	< MDA	0	< MDA	12
Trexler Hall Room 178 (Lounge)					
(A) Southeast wall (33)	< MDA	< MDA	1	< MDA	13
(B) Floor near middle of SE wall (34)	< MDA	< MDA	1	< MDA	14

LOCATION (wipe sample no.)	AVERAGE FIXED POINT MEASUREMENT (dpm/100 cm ²)	MAXIMUM FIXED POINT MEASUREMENT (dpm/100 cm ²)	μREM/HOUR ABOVE BACKGROUND AT ONE METER	REMOV- ABLE ALPHA CONTAMI- NATION (dpm/100 cm ²)	REMOV- ABLE BETA- GAMMA CONTAMI- NATION (dpm/100 cm ²)
(C) Northeast wall (35)	< MDA	< MDA	1	< MDA	16
(D) Floor near middle of NE wall (36)	< MDA	< MDA	1	< MDA	12
(E) Wall at north corner (37)	< MDA	< MDA	1	< MDA	15
(F) Northwest wall (38)	< MDA	< MDA	1	< MDA	< MDA
(G) Floor near middle of NW wall (39)	< MDA	< MDA	1	< MDA	< MDA
(H) Wall at west corner (40)	< MDA	< MDA	1	< MDA	< MDA
(I) Floor near middle of SW wall (41)	< MDA	< MDA	1	< MDA	< MDA
(J) Southwest wall (42)	< MDA	< MDA	1	< MDA	< MDA
(K) Midfloor (43)	< MDA	< MDA	1	< MDA	10
(L) Midfloor (44)	< MDA	< MDA	1	< MDA	10

LOCATION (wipe sample no.)	AVERAGE FIXED POINT MEASUREMENT (dpm/100 cm ²)	MAXIMUM FIXED POINT MEASUREMENT (dpm/100 cm ²)	μREM/HOUR ABOVE BACKGROUND AT ONE METER	REMOV- ABLE ALPHA CONTAMI- NATION (dpm/100 cm ²)	REMOV- ABLE BETA- GAMMA CONTAMI- NATION (dpm/100 cm ²)
Trexler Hall Room 177A (Scrub room)					
Sink (45)	< MDA	< MDA	2	< MDA	12
(A) Northwest wall	< MDA	< MDA	3	-	-
(B) Southwest wall (46)	< MDA	< MDA	3	< MDA	12
(C) Southeast wall (47)	< MDA	< MDA	3	< MDA	11
(D) Middle of floor (48)	< MDA	< MDA	2	< MDA	12
(E) Floor near sink (49)	< MDA	< MDA	2	< MDA	13
Trexler Hall Room 177B					
(A) Northeast wall near door (50)	< MDA	< MDA	1	< MDA	12
(B) Northeast wall near north corner	< MDA	< MDA	0	-	-
(C) Northwest wall near west corner (51)	< MDA	< MDA	3	< MDA	13

LOCATION (wipe sample no.)	AVERAGE FIXED POINT MEASUREMENT (dpm/100 cm ²)	MAXIMUM FIXED POINT MEASUREMENT (dpm/100 cm ²)	μREM/HOUR ABOVE BACKGROUND AT ONE METER	REMOV- ABLE ALPHA CONTAMI- NATION (dpm/100 cm ²)	REMOV- ABLE BETA- GAMMA CONTAMI- NATION (dpm/100 cm ²)
(D)Southwest wall (52)	< MDA	< MDA	3	< MDA	13
Middle of Floor (53)	< MDA	< MDA	0	< MDA	13
Trexler Hall Room 176					
Hood on NW wall apron (54)	< MDA	< MDA	2	< MDA	13
Hood on NW wall left inside wall (55)	< MDA	< MDA	2	< MDA	10
Hood on NW wall back inside wall (56)	< MDA	< MDA	2	< MDA	11
Hood on NW wall right inside wall (57)	< MDA	< MDA	2	< MDA	12
Hood on SW wall apron (58)	< MDA	< MDA	2	< MDA	12
Hood on SW wall left inside wall (59)	< MDA	< MDA	2	< MDA	12

LOCATION (wipe sample no.)	AVERAGE FIXED POINT MEASUREMENT (dpm/100 cm ²)	MAXIMUM FIXED POINT MEASUREMENT (dpm/100 cm ²)	μREM/HOUR ABOVE BACKGROUND AT ONE METER	REMOV- ABLE ALPHA CONTAMI- NATION (dpm/100 cm ²)	REMOV- ABLE BETA- GAMMA CONTAMI- NATION (dpm/100 cm ²)
Hood on SW wall back inside wall (60)	< MDA	< MDA	1	< MDA	12
Hood on SW wall right inside wall (61)	< MDA	< MDA	1	< MDA	10
Southeast wall (62)	< MDA	< MDA	4	< MDA	10
Northeast wall (63)	< MDA	< MDA	3	< MDA	10
Middle of floor (64)	< MDA	< MDA	2	< MDA	11

1 - Minimum Detectable Activity (MDA) for alpha contamination: 2.6 for samples 1 - 36 counted on 1/17/97
2.1 for samples 38 - 64 counted on 1/21/97

2 - MDA for beta contamination: 6.2 for samples 1 - 36 counted on 1/17/97
7.0 for samples 38 - 64 counted on 1/21/97

3 - MDA for fixed point measurements: 2,500 dpm/100 cm²

SURVEY INSTRUMENTS USED FOR CONFIRMATORY SURVEY

ROANOKE COLLEGE

DECEMBER 19, 1996

1. Ludlum Model 3 Ratemeter with Model 44-9 "pancake" probe
Serial No.: 102518 Calibrated: 2/26/96
Background: 30 - 40 cpm Efficiency: N/A MDA: 2,500 dpm/100 cm² fixed point measurements
5,000 dpm/100 cm² scanning measurements
2. Ludlum Model 19 microR meter
Serial No.: 101627 Calibrated: 1/26/96
Background: 6 μ rem/hour Efficiency: N/A MDA: N/A
3. The removable contamination smears were counted on a Gamma Products Model G5000 gas proportional laboratory counter. The MDA for alpha contamination was 2.6 dpm/100 cm² for samples counted on 1/17/97 and 2.1 dpm/100 cm² for samples counted on 1/21/97. The MDA for beta contamination was 6.2 dpm/100 cm² for samples counted on 1/17/97 and 7.0 dpm/100 cm² for samples counted on 1/21/97.