

EARLHAM

COLLEGE

Fax to: 630-515-1078

Mail Control No. 612056

From: 765-983-1691 (FAX)

June 15, 2019

Materials Licensing Branch
U.S. Nuclear Regulatory Commission, Region III
2443 Warrenville Rd, Suite 210
Lisle, IL 60532-4352

Greetings,

This letter contains an application for an amendment to NRC license 13-05737-01.

Licensee is Earlham College
801 National Rd. West
Richmond, IN 47374-4095

The person to be contacted about this application is John Howell (current RSO); contact can be made at (765) 983-1670 or jhowell@earlham.edu. John's snail-mail address is

John Howell
Earlham College Drawer 138
801 National Rd. West
Richmond, IN 47374-4095

Earlham would like to request that its license be changed to reflect the fact that we have transferred 12 of our registered sources to Applied Health Physics, LLC for disposal. Applied Health Physics has a Pennsylvania state license: PA-0228, with expiration date April 30, 2023. They are licensed to receive all of the sources in question.

As referenced on our license, the sources in question are A, B and D:

A. Cobalt-60.	Sealed Sources (Atomic Energy of Canada Model No. MC-25)	one source, not to exceed 5 millicuries
B. Cesium-137	Sealed Sources (Monsanto Model MRC-G-S-W-CS)	one source, not to exceed 2 millicuries
D. Plutonium-239	Plated sources	10 sources not to exceed 0.1 microcurie per source and 1 microcurie total

Attached is a copy of the certificate from Applied Health Physics, LLC. You may note that the amounts listed on their certificate are different from the amounts on our license. For sources A and B, Applied Health Physics calculated the present strengths of the sources, based on their

initial values and their ages. Thus, their certificate gives a lower level of activity than permitted on the license, and of course a lower level would not violate the terms of the license.

For source D, the certificate from Applied Health Physics mistakenly suggests the activity could be as high as $6 \mu\text{Ci}$. A value as high as $6 \mu\text{Ci}$ would exceed the conditions on our license, which requires a total of less than $1.0 \mu\text{Ci}$. However, the correct activity can be found from the documentation Earlham has from the acquisition of these plated source, documentation (attached) which states that each plated planchet has an activity between 5,000 and 20,000 disintegrations per minute. All 10 together therefore have a maximum activity of 200,000 disintegrations per minute, which corresponds to a total maximum activity of $0.1 \mu\text{Ci}$. I suspect someone may have determined total activity as $6 \mu\text{Ci}$ by misreading the maximum activity to be 200,000 disintegrations per second, rather than per minute.

Also attached are the most recent leak test for these sources, dated May 15, 2019. In addition to the 12 sources delivered to Applied Health Physics, the summary of the leak tests references a 13th test for sample ID M1112. That is our PuBe source, which was not transferred to Applied Health Physics

So after this transfer, Earlham has only one registered source, which is source C on our present license:


C. Plutonium-239

Encapsulated
Neutron source # M-1112

2 Curies (32 grams)

Thank you for your attention to this.

Sincerely,



John Howell, RSO of Earlham College

Calibration Due Date: 5-15-20



UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

APR 21 1965

Loan No. DNET65-54

Dr. David Telfair, Chairman
Department of Physics
Earlham College
Richmond, Indiana

Dear Dr. Telfair:

Reference is made to your letter proposal requesting the loan of material for educational and training purposes, dated December 2, 1964.

We are pleased to inform you that the Commission will loan to your institution without charge the following:

Ten (10) plutonium-238/239 alpha sources, each from 5,000 to 20,000 disintegrations per minute, electroplated on stainless steel planchets.

In order to possess this material you will require a specific license from the AEC. The license application should be submitted to the AEC Division of Materials Licensing using the enclosed form.

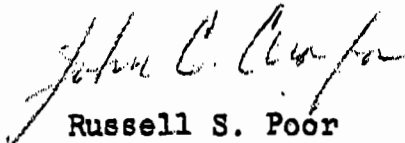
Please acknowledge acceptance of this loan of material, including the conditions by signing in the space provided and returning the original copy of this letter to the Grants and Materials Loan Branch of this Division. Inquiries concerning the loan should be referred to that Branch.

Upon receiving your acceptance of this loan, we will request the AEC Savannah River Operations Office to arrange for delivery of the material, subject to your having the appropriate license. It will expedite

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matters if you give our Grants and Materials Loan Branch a delivery address for the sources, which will be sent by mail.

Sincerely yours,



Russell S. Poor
Director
Division of Nuclear Education & Training

Enclosures:

1. Conditions of Loan
2. Application for SNM Licenses (4)
3. CFR Part 70

Accepted by:

(Duly Authorized Officer - Signature)

(Name - typed)

(Title)

(Institution)

(Date)

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Co-60Serial # MC-25Activity: 0.025 CuriesDate of Test: 5/15/2019Efficiency: 49.59**Counts per minute**

Gross

Bkg

Net

312

$$\frac{\text{Net CPM}}{\text{Efficiency} \times 2.22 \times 10^6 \text{ DPM/}\mu\text{Ci}} = \text{microcurie}$$

The removable activity was: 1.82E-08 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 (5.0×10^{-3}) microcuries or more of activity during the wipe test.

Assay Number: 060319-12Assay Date: 6/3/2019Performed by: G.McFeely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Cs-137Serial # MRC-G-S-W-CSActivity: 0.002 CuriesDate of Test: 5/15/2019Efficiency: 49.59**Counts per minute**

Gross

Bkg

Net

110Net CPMEfficiency x 2.22 x 10E-6 DPM/ uCi= microcurieThe removable activity was: 0.00E+00 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 (5.0 x 10E-3) microcuries or more of activity during the wipe test.

Assay Number: 060319-13Assay Date: 6/3/2019Performed by: G.McFeely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Pu-238/239Serial # P378Activity: 0.00000001 CuriesDate of Test: 5/15/2019Efficiency: 32.90**Counts per minute**

Gross

Bkg

Net

00.2-0.2Net CPMEfficiency x 2.22×10^{-6} DPM/ μ Ci

= microcurie

The removable activity was: -2.74E-09 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 (5.0×10^{-3}) microcuries or more of activity during the wipe test.

Assay Number: 060319-1Assay Date: 6/3/2019Performed by: G.McFeely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Pu-238/239Serial # P379Activity: 0.00000001 CuriesDate of Test: 5/15/2019Efficiency: 32.90**Counts per minute**

Gross

Bkg

Net

00.2-0.2Net CPMEfficiency x 2.22 x 10E-6 DPM/ uCi= microcurieThe removable activity was: -2.74E-09 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 ($5.0 \times 10E-3$) microcuries or more of activity during the wipe test.

Assay Number: 060319-2Assay Date: 6/3/2019Performed by: G.McFeely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Pu-238/239Serial # P380Activity: 0.00000001 CuriesDate of Test: 5/15/2019Efficiency: 32.90**Counts per minute**

Gross

Bkg

Net

00.2-0.2

Net CPM
Efficiency x 2.22 x 10E-6 DPM/ uCi = microcurie

The removable activity was: -2.74E-09 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 ($5.0 \times 10E-3$) microcuries or more of activity during the wipe test.

Assay Number: 060319-3Assay Date: 5/15/2019Performed by: G.McFaely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Pu-238/239Serial # P381Activity: 0.00000001 CuriesDate of Test: 5/15/2019Efficiency: 32.90**Counts per minute**

Gross

Bkg

Net

10.20.8Net CPMEfficiency x 2.22 x 10E-6 DPM/ uCi= microcurieThe removable activity was: 1.10E-08 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 ($5.0 \times 10E-3$) microcuries or more of activity during the wipe test.

Assay Number: 060319-4Assay Date: 5/15/2019Performed by: G.McFeely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Pu-238/239Serial # P382Activity: 0.00000001 CuriesDate of Test: 5/15/2019Efficiency: 32.90**Counts per minute**

Gross

Bkg

Net

00.2-0.2Net CPMEfficiency x 2.22 x 10E-6 DPM/ uCi

= microcurie

The removable activity was: -2.74E-09 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.006 ($6.0 \times 10E-3$) microcuries or more of activity during the wipe test.

Assay Number: 060319-5Assay Date: 6/3/2019Performed by: G.McFeely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Pu-238/239Serial # P363Activity: 0.00000001 CuriesDate of Test: 5/15/2019Efficiency: 32.90**Counts per minute**

Gross

Bkg

Net

00.2-0.2Net CPMEfficiency x 2.22 x 10E-6 DPM/ uCi= microcurieThe removable activity was: -2.74E-09 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 ($5.0 \times 10E-3$) microcuries or more of activity during the wipe test.

Assay Number: 060319-6Assay Date: 6/3/2019Performed by: G.McFeely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Pu-238/239Serial # P384Activity: 0.00000001 CuriesDate of Test: 5/15/2019Efficiency: 32.90**Counts per minute**

Gross

Bkg

Net

00.2-0.2
$$\frac{\text{Net CPM}}{\text{Efficiency} \times 2.22 \times 10^6 \text{ DPM/ } \mu\text{Ci}} = \text{microcurie}$$
The removable activity was: -2.74E-09 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 (5.0×10^{-3}) microcuries or more of activity during the wipe test.

Assay Number: 060319-7Assay Date: 6/3/2019Performed by: G.McFeely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Pu-238/239Serial # P385Activity: 0.00000001 CuriesDate of Test: 5/15/2019Efficiency: 32.90**Counts per minute**

Gross

Bkg

Net

00.2-0.2Net CPMEfficiency x 2.22 x 10E-6 DPM/ uCi= microcurieThe removable activity was: -2.74E-09 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 (5.0×10^{-3}) microcuries or more of activity during the wipe test.

Assay Number: 080319-8Assay Date: 6/3/2019Performed by: G.McFeely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Pu-238/239Serial # P386Activity: 0.00000001 CuriesDate of Test: 5/15/2019Efficiency: 32.90**Counts per minute**

Gross

Bkg

Net

00.2-0.2Net CPMEfficiency x 2.22 x 10E-6 DPM/ uCi= microcurieThe removable activity was: -2.74E-09 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 ($5.0 \times 10E-3$) microcuries or more of activity during the wipe test.

Assay Number: 060319-9Assay Date: 6/3/2019Performed by: G.McFeely

**Sealed Source Leak Test Certificate**Location: 801 National Road Richmond, INCustomer: Earlham CollegeRadionuclide: Pu-238/239Serial # P387Activity: 0.00000001 CuriesDate of Test: 5/15/2019Efficiency: 32.90**Counts per minute**

Gross

Bkg

Net

20.21.8Net CPMEfficiency x 2.22 x 10E-8 DPM/ uCi

= microcurie

The removable activity was: 2.48E-08 microcuries

The above source leak test has been performed in accordance with our Radioactive materials license and the appropriate regulatory requirements. The regulations define a leaking source as one which results in the removal of 0.005 ($5.0 \times 10E-3$) microcuries or more of activity during the wipe test.

Assay Number: 060319-10Assay Date: 6/3/2019Performed by: G.McFeely

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Sealed Source Leak Test Spreadsheet

Earlham College 801 National Road Richmond, IN. 47374							
Source ID	Radionuclide	Activity (Curies)	Serial Number	Wipe Date	Wipe Test Result (uCi)	Regulatory Limit (uCi)	Test Result
P378	Pu-238/239	0.00000001	P378	5/15/2019	-2.74E-09	5.00E-03	PASS
P379	Pu-238/239	0.00000001	P379	5/15/2019	-2.74E-09	5.00E-03	PASS
P380	Pu-238/239	0.00000001	P380	5/15/2019	-2.74E-09	5.00E-03	PASS
P381	Pu-238/239	0.00000001	P381	5/15/2019	1.10E-08	5.00E-03	PASS
P382	Pu-238/239	0.00000001	P382	5/15/2019	-2.74E-09	5.00E-03	PASS
P383	Pu-238/239	0.00000001	P383	5/15/2019	-2.74E-09	5.00E-03	PASS
P384	Pu-238/239	0.00000001	P384	5/15/2019	-2.74E-09	5.00E-03	PASS
P385	Pu-238/239	0.00000001	P385	5/15/2019	-2.74E-09	5.00E-03	PASS
P386	Pu-238/239	0.00000001	P386	5/15/2019	-2.74E-09	5.00E-03	PASS
P387	Pu-238/239	0.00000001	P387	5/15/2019	2.46E-08	5.00E-03	PASS
M1112	Pu-238	2	M1112	5/15/2019	-2.74E-09	5.00E-03	PASS
MC-25	Co-60	0.025	MC-25	5/15/2019	1.82E-08	5.00E-03	PASS

Project: Earlham College 6-3-19 Leak Tests

Carrier #	Count Time	Sample ID	Count Date	α Bkg - CPM	By Bkg - CPM	α CPM	By CPM	α Eff.	By Eff.	α DPM	By DPM
31	Routine 2	P378	6/3/2019	0.2	1	0	4	32.9	49.59	-0.61	6.05
32	Routine 2	P379	6/3/2019	0.2	1	0	1	32.9	49.59	-0.61	0
33	Routine 2	P380	6/3/2019	0.2	1	0	3	32.9	49.59	-0.61	4.03
34	Routine 2	P381	6/3/2019	0.2	1	1	1	32.9	49.59	2.43	0
35	Routine 2	P382	6/3/2019	0.2	1	0	1	32.9	49.59	-0.61	0
36	Routine 2	P383	6/3/2019	0.2	1	0	1	32.9	49.59	-0.61	0
37	Routine 2	P384	6/3/2019	0.2	1	0	4	32.9	49.59	-0.61	6.05
38	Routine 2	P385	6/3/2019	0.2	1	0	0	32.9	49.59	-0.61	-2.02
39	Routine 2	P386	6/3/2019	0.2	1	0	12	32.9	49.59	-0.61	22.18
40	Routine 2	P387	6/3/2019	0.2	1	2	0	32.9	49.59	5.47	-2.02
41	Routine 2	M1112	6/3/2019	0.2	1	0	4	32.9	49.59	-0.61	6.05
42	Routine 2	MC-25	6/3/2019	0.2	1	0	3	32.9	49.59	-0.61	4.03
43	Routine 2	MRC-G-S-W-CS	6/3/2019	0.2	1	0	1	32.9	49.59	-0.61	0

Project: Earlham College Leak Tests

Carrier #	Count Time	Sample ID	Count Date	a Bkg - CPM	By Bkg - CPM	a CPM	By CPM	a EFL	By EFL	a DPM	By DPM	Test Date	Assay #	Performed	Location	Customer	Isotope	CI Activity
1	Routine 2 - 1 minute	P378	6/3/2019	0.2	1	0	4	32.90	49.59	-0.61	6.05	5/15/2019	060319-1	G.McFeely	National Road Richmond	Earlham College	Pu-238/239	0.00000001
2	Routine 2 - 1 minute	P379	6/3/2019	0.2	1	0	1	32.90	49.59	-0.61	0	5/15/2019	060319-2	G.McFeely	National Road Richmond	Earlham College	Pu-238/239	0.00000001
3	Routine 2 - 1 minute	P380	6/3/2019	0.2	1	0	3	32.90	49.59	-0.61	4.03	5/15/2019	060319-3	G.McFeely	National Road Richmond	Earlham College	Pu-238/239	0.00000001
4	Routine 2 - 1 minute	P381	6/3/2019	0.2	1	1	1	32.90	49.59	2.43	0	5/15/2019	060319-4	G.McFeely	National Road Richmond	Earlham College	Pu-238/239	0.00000001
5	Routine 2 - 1 minute	P382	6/3/2019	0.2	1	0	1	32.90	49.59	-0.61	0	5/15/2019	060319-5	G.McFeely	National Road Richmond	Earlham College	Pu-238/239	0.00000001
6	Routine 2 - 1 minute	P383	6/3/2019	0.2	1	0	1	32.90	49.59	-0.61	0	5/15/2019	060319-6	G.McFeely	National Road Richmond	Earlham College	Pu-238/239	0.00000001
7	Routine 2 - 1 minute	P384	6/3/2019	0.2	1	0	4	32.90	49.59	-0.61	6.05	5/15/2019	060319-7	G.McFeely	National Road Richmond	Earlham College	Pu-238/239	0.00000001
8	Routine 2 - 1 minute	P385	6/3/2019	0.2	1	0	0	32.90	49.59	-0.61	-2.02	5/15/2019	060319-8	G.McFeely	National Road Richmond	Earlham College	Pu-238/239	0.00000001
9	Routine 2 - 1 minute	P386	6/3/2019	0.2	1	0	12	32.90	49.59	-0.61	22.18	5/15/2019	060319-9	G.McFeely	National Road Richmond	Earlham College	Pu-238/239	0.00000001
10	Routine 2 - 1 minute	P387	6/3/2019	0.2	1	2	0	32.90	49.59	5.47	-2.02	5/15/2019	060319-10	G.McFeely	National Road Richmond	Earlham College	Pu-238/239	0.00000001
11	Routine 2 - 1 minute	M1112	6/3/2019	0.2	1	0	4	32.90	49.59	-0.61	6.05	5/15/2019	060319-11	G.McFeely	National Road Richmond	Earlham College	Pu-238	2.00000000
12	Routine 2 - 1 minute	MC-25	6/3/2019	0.2	1	0	3	32.90	49.59	-0.61	4.03	5/15/2019	060319-12	G.McFeely	National Road Richmond	Earlham College	Co-60	0.02500000
	Routine 2 - 1 minute	ARC-G-S-W-C	6/3/2019	0.2	1	0	1	32.90	49.59	-0.61	0	5/15/2019	060319-13	G.McFeely	National Road Richmond	Earlham College	Cs-137	0.00200000