



Radioactive alpha foil source test report

Item No. Q23955
 Radionuclide Americium-241 Product code AMMQ3619 Nominal Activity 10 microcuries
 Description Alpha Foil Disc in SIP1 Holder Quantity 3
 BSI/ISO Classification - Special Form Certificate No. -
This classification complies with BS.5288 - 1976 which is in agreement with ISO 2919 (see overleaf for definition)
Classifications are based on the testing of specimen sources and give the levels expected from production sources.
 Recommended working life 15 years
 See overleaf for explanation

Method of detecting surface contamination

The sources have been wiped, in batches of³, in accordance with Wipe Test A, as defined overleaf.

Quality Control Department Reference(s):

32414

Signed *R. Peacock*
Radiation Sources Department

Date 11th April 1979

Customer Amersham Corporation

Customer's order no. S968

The Radiochemical Centre Ltd
registered England 1002610

registered office: White Lion Road Amersham Buckinghamshire HP7 9LL
telephone: Little Chalfont (024 04) 4444

cables: Activity Amersham
telex: 83141

Quality control

Testing for leakage and contamination

Stringent tests for leakage are an essential feature of radioactive sources production. The methods adopted depend on the design and intended application of the source, and also on statutory requirements. Where necessary, tests can be specially modified to meet particular requirements.

The standard methods used for testing radiation sources are listed below.

Wipe test A

The source is wiped with a swab or tissue, moistened with ethanol or water; the activity removed is measured. Limit: 0.005 μ Ci.
(This test conforms to BS.5288/App. D.2:1)

Wipe test B

The source is wiped with a swab or tissue, moistened with ethanol or water; the activity removed is measured. Limit: 0.05 μ Ci.

Bubble test D

The source is immersed in a suitable liquid (ethanediol) and the pressure in the vessel reduced to 100mm of mercury. No bubbles must be observed.
(This test conforms to BS.5288/App. D.3:1, except that for some sources, the 100mm³ free volume requirement is not met).

Immersion test F

The source is immersed in water at 50°C for 8 hours and the activity in the water measured.
Limit: 0.05 μ Ci.

Immersion test L

The source is immersed in water at 50°C for 4 hours and the activity in the water measured.
Limit: 0.005 μ Ci.
(This test conforms to BS.5288/App. D.2:3)

Immersion test M

The source is immersed in water which is raised to 100°C and held at that temperature for 10 min. The water is then removed, the source cooled, and the procedure repeated twice. Sources are passed if the activity extracted in the final procedure does not exceed 0.005 μ Ci.
(This test conforms to BS.5288/App. D.2:4)

Helium mass spectrometer test H

Limit: leak rate of 10⁻⁸ standard cm³/sec.
(This test used conforms to either BS.5288/App. D.3:4 or D.3:5, but our limit is much more stringent).

Emanation test K

(scintillation counting test for radon)
The appliance is immersed in a solution of a phosphor in an organic liquid under vacuum; the leakage of radon is measured by liquid scintillation counting. (DWIGHT, D. J. Radiochemical Centre Report R.176.)
The limit corresponds to about 5 x 10⁻¹¹Ci per 24 hours.
(This test conforms to BS.5288/App. D.2:6, but our limit is 200 times more stringent).

IAEA Special Form

'Special Form' is a test specification for sealed sources given in the IAEA transport regulations. (IAEA Safety Series No. 6, 1967/1973 revised edition).

It is used in determining the maximum acceptable activities for various types of transport containers.

The required tests are:

- impact test
 - percussion test
 - bending test (only for long, slender sources)
 - heat test.
- After each test the source must be subjected to immersion testing.

The certificate (SFC) numbers given are those issued by the Dept. of the Environment, the competent authority in the UK for administering the IAEA regulations.

11973 regulations not yet universally adopted.

Source working life

The 'recommended working life' is our recommendation of the period within which the source should be replaced. The period given has been assessed on the basis of such factors as, toxicity of nuclide, total initial activity, source construction (eg capsule design, source insert type, etc), half-life of nuclide, typical application environments, operational experience, test performance data, etc.
Adverse environments could affect the appearance and integrity of a source. It is the user's responsibility to regularly inspect and test the source in order to assess at what point during the 'recommended working life' the source should be replaced.

ISO Classification

The International Organization for Standardization (ISO) has proposed a system of classification of sealed radioactive sources based on safety requirements for typical uses (see ISO.2919).

"This system provides a manufacturer of sealed radioactive sources with a set of tests to evaluate the safety of his products under working conditions. It also assists a user of such sealed sources to select types which suit the application he has in mind, especially where protection against the release of radioactive material is concerned".

The tests to which specimen sources are subjected are listed in Table 1.

Each test can be applied in several degrees of severity. Test results are expressed as a five figure code to indicate the severity of the tests.

These figures are preceded by the letter C or E to show whether the source activity is less than or greater than certain limits. These limits depend upon the toxicity, solubility and reactivity of the active component of the source.

C indicates that the activity level of the source does not exceed the prescribed limit and
E that the limit is exceeded.

Table 1. Classification of sealed source performance standards

Test	Class 1	2	3	4	5	6
Temperature	No test	-40°C (20 min) +80°C (1 h)	-40°C (20 min) +180°C (1 h)	-40°C (20 min) +400°C (1 h) and thermal shock 400°C to 20°C	-40°C (20 min) +600°C (1 h) and thermal shock 600°C to 20°C	-40°C (20 min) +800°C (1 h) and thermal shock 800°C to 20°C
External pressure	No test	25kPa absolute to atmospheric pressure	25kPa absolute to 2MPa absolute	25kPa absolute to 7MPa absolute	25kPa absolute to 70MPa absolute	25kPa absolute to 170MPa absolute
Impact	No test	50g from 1m	200g from 1m	2kg from 1m	5kg from 1m	20kg from 1m
Vibrations	No test	30min 25Hz to 500Hz at 5g _n peak amplitude	30min 25Hz to 50Hz at 5g _n peak amplitude and 50Hz to 90Hz at 0.635mm amplitude peak to peak and 90Hz to 500Hz at 10g _n	90min 25Hz to 80Hz at 1.5mm amplitude peak to peak and 80Hz to 2000Hz at 20g _n		
Puncture	No test	1g from 1m	10g from 1m	50g from 1m	300g from 1m	1kg from 1m

Notes to Table 1

1. Details of the testing procedures are given in ISO.2919 and BS.5288. A further class X can be used where a special test procedure has been adopted.

3. Impact test

The source, positioned on a steel anvil, is struck by a steel hammer of the required weight; the hammer has a flat striking surface, 25mm diam. with the edges rounded.

2. External pressure

100kPa = 1 atmosphere (approx.)

4. Puncture test

The source, positioned on a hardened steel anvil, is struck by a hardened pin, 6mm long, 3mm diam. with hemispherical end, fixed to a hammer of the required weight.

Performance requirements for typical uses

Typical applications in which sealed radioactive sources may be used, with minimum performance requirements are also given in ISO.2919 (see Table 2 below). These recommendations take into account normal usage and reasonable acceptance risks, but do not include exposure to the risk of fire, explosion or corrosion.

Table 2. Sealed source performance requirements for typical uses

Sealed source use	Sealed source test and class	Sealed source test and class				
		Temperature	Pressure	Impact	Vibration	Puncture
Industrial radiography	Unprotected source	4	3	5	1	5
	Source in device	4	3	3	1	3
Gamma gauges (medium and high energy)	Unprotected source	4	3	3	3	3
	Source in device	4	3	2	3	2
Beta gauges and sources for low energy gamma gauges or X-ray fluorescence analysis (excluding gas-filled sources)		3	3	2	2	2
Oil well logging		5	6	5	2	2
Portable moisture and density gauges (including hand held or dolly transported)		4	3	3	3	3
General neutron source application (excluding reactor start-up)		4	3	3	2	3
Calibration sources, activity greater than 30 μ Ci		2	2	2	1	2
Gamma irradiation sources	Unprotected source	4	3	4	2	4
	Source in device	4	3	3	2	3
Ion generators (source-device combination may be tested)	Chromatography	3	2	2	1	1
	Static eliminators	2	2	2	2	2
	Smoke detectors	3	2	2	2	2
Medical	Radiography	3	2	3	1	2
	Gamma teletherapy	5	3	5	2	4
	Beta teletherapy	5	3	3	2	2
	Interstitial and intracavitary appliances*	5	3	2	1	1
	Surface applicators	4	3	3	1	2

*Sources of this nature may be subject to severe deformation in use. Manufacturers and users may wish to formulate additional or special test procedures.

If the sealed source has a 'C' classification,

Table 2 can be used directly to assess the suitability of the source for the proposed application provided that there is no significant fire, explosion or corrosion hazard.

If such a hazard does exist, the user and the manufacturer have to consider the following factors to determine whether additional testing is required:

- 1, consequences of loss of activity,
- 2, quantity of active material contained in the source,
- 3, radiotoxicity,
- 4, chemical and physical form of the material and the geometrical shape,
- 5, environment in which it is to be used,
- 6, protection afforded to the source or source-device combination.

If the sealed source has an 'E' classification,

Table 2 cannot be used directly.

To determine whether any additional testing is necessary, an evaluation of the fire, explosion and corrosion hazards must first be made and a separate evaluation of the use and design of the source.

Some of our source designs exceed the recommendations of Table 2 and may therefore be acceptable for the applications listed despite the 'E' classification.

Acknowledgement: Tables from BS.5288:1976 are reproduced by permission of BSI, 2 Park Street, London W1A 2BS from whom complete copies can be obtained.

Laboratory applications


The ISO classification system does not refer explicitly to sources designed for research laboratory usage because of the wide variety of applications and environments in which such sources might be used.

Special applications

No test programme can cover all possible combinations of environments to which a source may be exposed.

Users should therefore consult our technical staff before using sources in potentially adverse environments.

REQUISITION TO PURCHASING DEPT. PLEASE TYPE AND FORWARD ORIGINAL					TOTAL ESTIMATE	DATE 12/19/78	REQ. NO. 1279
Code	Class	Dept. No.	Account	Job No.	Dept. Name MASCA	TEL. NO.	
Delivery Address: MASCA THE UNIVERSITY MUSEUM					Grant or Contract No. Soc 75-04203 (part 263)	P.O. NO.	
C/O DR. S. J. FLEMING					Authorized Signature		
Quantity	Cat. No.	Description				Unit Cost	Total Cost Per Line
3	AMM- Foil	10 microCurie Americium-241 sources (12.5 mm diam.)				158	
		AS ATTACHED QUOTATION				158	474
Duplicate sent 3/6/79 same Reg. #							
SUGGESTED VENDOR → Form No. Pur-1-574					G. W. Dunbar, Jr. Marketing Manager AMERSHAM 2636 S. CLEARBROOK DRIVE ARLINGTON HTS. IL 60005		TOTAL 474 632 USE SEPARATE REQUISITION FOR EACH CODE



Amersham
AMERSHAM CORPORATION:
A SUBSIDIARY OF THE RADIOCHEMICAL CENTRE
2636 S. CLEARBROOK DRIVE
ARLINGTON HEIGHTS, ILL 60005

PACKING LIST NO. **195700**

DATE **04/13/79**

CUSTOMER SERVICE REPRESENTATIVE **JR**

CALLER NAME

PACKING LIST

SHIP TO UNIV OF PENNSYLVANIA
3400 SPRUCE STREET
71 PHILADELPHIA
PA 19104
R. Cathleen Ryan

ATTN TO FLEMING X4058
243 7216

YOUR PURCHASE ORDER NUMBER **4807**

SOLD TO UNIV OF PENNSYLVANIA
PURCHASING DEPT
05 3451 WALNUT STREET
PHILADELPHIA
PA 19104

ATTN TO

LICENSE NUMBER *2-0011817*

ITEM NO.	CATALOG NUMBER	UNIT SIZE	BATCH NUMBER	PRODUCT DESCRIPTION	QUANTITY ORDERED	QUANTITY SHIPPED
1	AMM03619	10UCI	023955	AMERICINUM-241 ALPHA FOIL SOURCE	3	3
		<i>Michael</i>	<i>4051</i>			

SPECIAL ROUTING *2440992*

F.O.B. POINT **FACTORY**

SOURCE

Addresses for ordering in the United States:
Amersham Corporation
2636 S. Clearbrook Drive
Arlington Heights, Illinois 60005 USA
Telephone: Toll free (800) 323-9750
In Alaska, Hawaii, Puerto Rico, and Illinois:
(312) 593-6300

In Canada:
Amersham Corporation
505 Iroquois Shore Road
Oakville, Ontario, L6H 2R3
Telephone: (800) 261-5061
(Toll free)

In Latin America:
Amersham Corporation
2636 S. Clearbrook Drive
Arlington Heights, Illinois 60005 USA
Telephone: (312) 593-6300
Telex: 28 1067

Returns
All products to be returned must have prior authorization from our Customer Service Department. Items manufactured to customers' specifications cannot be returned for credit.

THIS ORDER IS SUBJECT TO THE TERMS AND CONDITIONS CONTAINED ON THE REVERSE SIDE OF THIS FORM
- ALL CLAIMS MUST BE MADE WITHIN 10 DAYS OF RECEIPT OF GOODS -

FORM NO. DP 1275 2B

Stuart
Fleming

TERMS AND CONDITIONS

1. Title to and risk of loss of goods shall pass to the Purchaser upon delivery to the carrier even if transportation costs are prepaid by the Seller.
2. The Purchaser shall submit payment within 30 days of the date of the invoice. The Seller shall have the right to modify, change or withdraw credit at any time and without notice.
3. Orders cannot be cancelled, transferred to others, or changed after receipt by the Seller; and deferred deliveries of goods made up or in process cannot be extended beyond the original date specified, except with the express written consent of the Seller.
4. All delivery dates are estimated as accurately as possible; however, the Seller assumes no responsibility or liability for any special, incidental or consequential loss or damage or for any other loss or damage occurring by reason of delay or inability to deliver caused by fire, strike, accident, embargo, car shortage, delay of carrier, insurrection, riot, act of civil or military authorities, or any other cause which is unavoidable or beyond the reasonable control of the Seller. If delays from any such cause occur, the delivery time is correspondingly extended.
5. Stenographic and clerical errors and omissions are subject to correction.
6. Use, consumption, compensating and similar taxes reflecting any governmental tax or fee are not included in the invoice price unless specifically stated as a separate item. If such taxes are not so stated, the Purchaser assumes responsibility for any such taxes applicable to this transaction.
7. The Seller warrants its products to be of the quality described in its current catalogs or technical data sheets.
This warranty is expressly in lieu of any other warranties, guarantees, obligations or liabilities which may be expressed or implied by the Seller or its representatives. All statutory and implied warranties including warranties of merchantability and fitness for a particular purpose and other than title are hereby expressly negated and excluded.
Any claims of breach of warranty must be received in writing by the Seller within 15 days of receipt of product by the Purchaser; except that for non-radioactive products, a 30 day period will be allowed. The maximum liability for breach of warranty shall be the invoice price of the product. Upon the Seller's request, the Purchaser shall return product to the Seller.
8. The Seller assumes no liability for consequential or incidental damages of any kind, and the Purchaser by acceptance of this service or product assumes all liability for and shall indemnify and hold the Seller harmless against the consequence of its use or misuse by the Purchaser, its employees or others. Further, the Purchaser agrees to defend any and all suits, claims and demands brought against the Seller and agrees to and will indemnify the Seller and save it harmless from and against any and all suits, claims and demands whatsoever for injuries to or death of any person, or damage to or loss of property alleged to be caused by, arising out of, in connection with or incidental to the Seller's furnishing of the service or product contemplated herein, whether or not such injury, death, loss or damage shall be caused or contributed to by the joint or concurring negligence of the Seller and agrees to and will pay, liquidate, discharge and satisfy any and all judgments, awards or expenses which may be rendered against or incurred by the Seller on account of injuries to or death of any person or loss or damage to any property whatsoever, caused by, arising out of, in connection with or incidental to the Seller's furnishing of the service or product contemplated herein, including but not limited to all costs of suit, attorney's fees and reasonable expenses in connection therewith, whether or not such judgment, award or expense is rendered against or incurred by the Seller, in whole or in part, because of the joint or concurring negligence of the Seller. As used in this paragraph, the word "Seller" shall include Amersham Corporation, its officers, directors, employees and agents. The Purchaser's care, custody and control, at any time of the service material, part or equipment contemplated herein shall give rise to a conclusive presumption between the parties that any negligence was joint or concurring. This paragraph, in its entirety also applies to suits, claims and demands based on the rules of strict liability and product liability.
9. Orders submitted on customer's own purchase order form containing statements, clauses, terms or conditions modifying, adding to, repugnant to, or inconsistent with the terms and conditions of the Seller herein contained, may only be deemed accepted by the Seller if so stated in writing by a duly authorized signatory of the Seller. The Purchaser further expressly agrees that such terms accepted by Seller are accepted only upon condition and with the expressed understanding that notwithstanding any statements, clauses, terms or conditions contained on any forms of the Purchaser the liabilities of the Seller shall be determined solely by the terms and conditions stated herein. The Seller expressly rejects any statement on a form of the Purchaser which purports to bind or limit the Purchaser's offer to purchase items supplied by the Seller to any terms, conditions or any other requirements unless expressly accepted by the Seller in accordance with the aforementioned. The Purchaser by ordering any items listed on this form expressly agrees to be bound by the terms and conditions herein. Acceptance by the Purchaser of any items offered for sale by the Seller is expressly limited to the terms and conditions contained herein and acceptance of said items shall be deemed to be acceptance of these terms and conditions. Any language rejecting these terms and conditions on a communication rejected by the Purchaser may become effective only upon a rejection of all said items ordered by the Purchaser. The Seller's acceptance of the Purchaser's performance inconsistent with any terms or conditions herein shall constitute a waiver as to said term or condition only.
10. If material is made to drawings and/or specifications of the Purchaser, it is upon the express condition that the Purchaser shall assume all responsibility and shall indemnify and hold the Seller harmless if the material infringes or contributes to the infringement of, or is alleged to infringe or contribute to the infringement of any letters, patent, copyright or trademark, where such infringement arose out of the designs, drawings or specifications supplied by the Purchaser alone or in combination with elements supplied by the Seller. All quotations on special materials are based and conditioned upon the Purchaser's acceptance of under-runs not exceeding ten percent of quantity ordered, to be paid for pro-rata.
11. The Purchaser agrees that in the performance hereof it will comply with all applicable laws, statutes, rules, regulations or orders of the National government or political subdivision thereof and same shall be deemed incorporated by reference herein.
- 11A. *In the United States:* Federal regulations require a copy of a Purchaser's NRC license or Agreement State License, together with all amendments, or a written certification that the Purchaser is authorized to receive radioactive material, to be on file at the Arlington Heights office of the Seller before any shipment of radioactive materials can be made.
This agreement shall be construed in accordance with the laws of the State of Illinois.
The Purchaser and the Seller each warrant that it is an equal opportunity employer and that if this order is placed as a contract or subcontract under United States Government prime contract, those clauses required by federal law to be included are herein incorporated by reference.
- 11B. *In Canada:* A copy of a customer's AECB license, together with all amendments must be on file at the Oakville office prior to any shipment of radioactive materials.
This agreement shall be construed in accordance with the laws of the Province of Ontario.
12. All prices quoted are in U.S. dollars. Sale, use, and excise taxes and retailers occupation taxes payable or collectable by Seller in connection with its sales shall be in addition to published prices, and Purchaser will reimburse Seller for same. In particular, Purchaser will reimburse Seller for all such California and Illinois taxes, if applicable, at the time of payment of the invoice whether or not such taxes are separately stated on the invoice.

University of Pennsylvania
Radiation Safety Office
Room 191 Towne Building D-3

Monitoring Report: MU-2

Responsible Investigator: Dr. Stuart Fleming

Area Surveyed: Rooms 182-188 Museum

Isotopes Used: No Isotopes have been used yet.

Date of Survey: 5-17-79

Background Information:

Dr. Fleming is assembling a group of sealed sources to be used in closed systems. None of the larger sources had been received yet so only a visual inspection of the area was done at this time.

Survey Results:

- a) A ^{14}C source formerly used by B. Ralph was turned over to the Radiation Safety Office for long term storage. A leak test on this source was negative.
- b) The following sources were on hand in unopened shipping containers; $^{241}\text{Am} - 10\mu\text{Ci}$
 $200\mu\text{Ci } ^{90}\text{Sr}$. These were kept in the lab area which is locked when unattended.
- c) Specific handling procedures, source security, monitoring and leak testing requirements were discussed with Dr. Fleming. He seemed aware of his responsibilities as a licensee.
- d) Dr. Fleming informed us he would notify us when the larger sources, ^{90}Sr arrive. Also he informed us that the $20\text{ mCi } ^{204}\text{Tl}$ source could not be provided by the supplier.

Sureyors: William C. Hoffman
William C. Hoffman

Joseph M. McCue
Joseph M. McCue

MEMORANDUM
OF CALL

TO: SF

YOU WERE CALLED BY— YOU WERE VISITED BY—

Eric Paisley

OF (Organization)

PLEASE CALL → PHONE NO. 919-748-8075
CODE/EXT.

WILL CALL AGAIN IS WAITING TO SEE YOU

RETURNED YOUR CALL WISHES AN APPOINTMENT

MESSAGE

about light sources

Saunders-Ree
Denel,

RECEIVED BY _____ DATE _____ TIME _____

STANDARD FORM 63
REVISED AUGUST 1967
GSA FPMR (41 CFR) 101-11.6

GPO : 1969-O-48-16-80341-1 332-889

63-108

**D. A. PITMAN LIMITED**

Jessamy Road · Weybridge · Surrey · England · KT13 8LE
Cables: Pitway Weybridge · Tel: Weybridge 46327 · Telex: 929823

Our Ref. HB/SC

30 October 1979

Mr S Fleming,
Scientific Director,
MASCA,
The University Museum,
The University of Pennsylvania,
33rd & Spruce Streets,
Philadelphia,
U.S.A.

Dear Mr Fleming,

Further to your letter dated 18 October 1979, regarding our Model 654 we suggest you contact our agent direct in the U.S.A. who will be able to assist you with price and delivery information.

Mr P Sanders,
The Aston Company,
P.O. Box 49123,
Atlanta,
GA 30359,
U.S.A.

We have informed our agent of your interest so I am sure he will only be too pleased to deal with your enquiry.

Assuring you of our best attention.

Yours sincerely,

Helena Brennan

Helena Brennan.

Enc.

SRDI SAUNDERS - ROE
DEVELOPMENTS, INC.

120 Reynolda Village
Winston-Salem, NC 27106 USA
Tel: 919-748-8075 Telex: 806455

December 13, 1979

Dr. Stuart Fleming
Scientific Director
MASCA
The University Museum
The University of Pennsylvania
33rd and Spruce Streets
Philadelphia, Pennsylvania 19104

Dear Dr. Fleming:

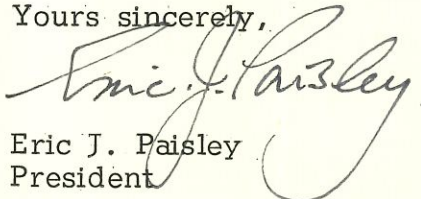
I enjoyed talking to you earlier today. As we discussed, please find enclosed a copy of SRDL Drawing DO3/DO4. We can produce DO4 (which is the specific type you referred to in your letter dated 18 October 1979) at 200 microlamberts in green, yellow and orange; blue at approximately 150 microlamberts and red at approximately 70 microlamberts.

Prices for small quantities (less than 10) would be approximately \$40 each. I can give you an accurate price when you can select specific color, brightness and quantity.

In the USA, these radioluminous lamps are, of course, under the Nuclear Regulatory Commission's authority. It is, therefore, necessary that you hold a Specific License before we can supply the lamps. I have no doubt the University already holds such a license; however, it will be necessary to ensure that it is amended to include Betalights. We will then require a photocopy. Red tape, I am afraid, but we have to do it.

Have a good Christmas and a splendid 1980.

Yours sincerely,




Eric J. Paisley
President

mdc

encls.



Sealed radioactive source test report


product code SIFQ3623	description STRONTIUM-90 BETA SOURCE		nominal activity 1 200 MICROCURIE (7.40 MEGABQ)	customer AMERSHAM CORPORATION 2636 SOUTH CLEARBROOK DRIVE ARLINGTON HEIGHTS ILLINOIS 60005 U S A	
TRC item no. Q30959			date 2 MAY 79		
BSI/ISO classification C64343	special form certificate no. 171	recommended working life 15 YEARS	902	customer's order no. S980 UNIVERSITY OF PENNSYLVANIA	
serial number 0229BC	measurement check PICO AMPS 200	measurement check date 30 APRIL 79	leakage test D 27 APRIL 79	leakage test L 27 APRIL 79	contamination test A 27 APRIL 79
notes Source Model No. SIF 1177				signed 	

this classification complies with BS.5288:1976, which is in agreement with ISO.2919 (see overleaf for definition and description of tests)

The Radiochemical Centre Ltd Amersham Buckinghamshire England HP7 9LL
 telephone: Little Chalfont 4444 (STD code 024 04)
 telegrams and cables: Activity Amersham Telex
 telex: 83141 ACTIVA G



Sealed radioactive source test report

product code SIFQ3680	description STRONTIUM-90 BETA SOURCE		nominal activity 1 2 MILLICURIE (74 MEGABQ)	customer AMERSHAM CORPORATION 2636 SOUTH CLEARBROOK DRIVE ARLINGTON HEIGHTS ILLINOIS 60005 U S A	
TRC item no. R27968			date 7 JUNE 79		
BSI/ISO classification C64343	special form certificate no. 171	recommended working life 15 YEARS	902	customer's order no. S1030 UNIVERSITY OF PENNSYLVANIA	
serial number 0240BC	measurement check PICO AMPS 213	measurement check date 25 MAY 79	leakage test D 23 MAY 79	leakage test L 24 MAY 79	contamination test A 24 MAY 79
notes SOURCE MODEL NUMBER SIF 1177				signed 	

this classification complies with BS.5288:1976, which is in agreement with ISO.2919 (see overleaf for definition and description of tests)

The Radiochemical Centre Ltd Amersham Buckinghamshire England HP7 9LL
 telephone: Little Chalfont 4444 (STD code 024 04)
 telegrams and cables: Activity Amersham Telex
 telex: 83141 ACTIVA G



Sealed radioactive source test report

product code SIF03679	description STRONTIUM-90 BETA SOURCE	nominal activity 1 20 MILLICURIE (740 MEGABQ)	customer AMERSHAM CORPORATION 2636 SOUTH CLEARBROOK DRIVE ARLINGTON HEIGHTS ILLINOIS 60005 U S A					
TRC item no. R27969		date 7 JUNE 79						
BSI/ISO classification C64343	special form certificate no. 171	recommended working life 15 YEARS	902 2	customer's order no. S1030 UNIVERSITY OF PENNSYLVANIA				
serial number 0241BC	measurement check PICO AMPS 2010	measurement check date 25 MAY 79	leakage test D 23 MAY 79	date passed	leakage test L 24 MAY 79	date passed	contamination test A 24 MAY 79	date passed
notes SOURCE MODEL NUMBER SIF 1177				signed <i>R. A. Edwards</i>				

this classification complies with BS.5288:1976, which is in agreement with ISO.2919 (see overleaf for definition and description of tests)

Extended area sources — ceramic pellet

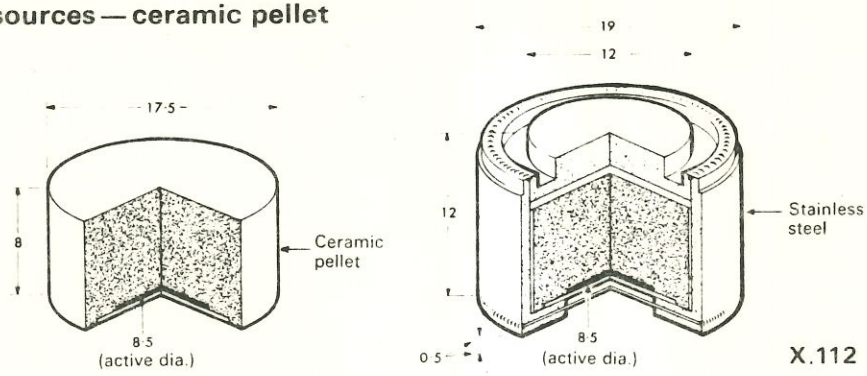


Figure 33

Extended area sources — metal foil

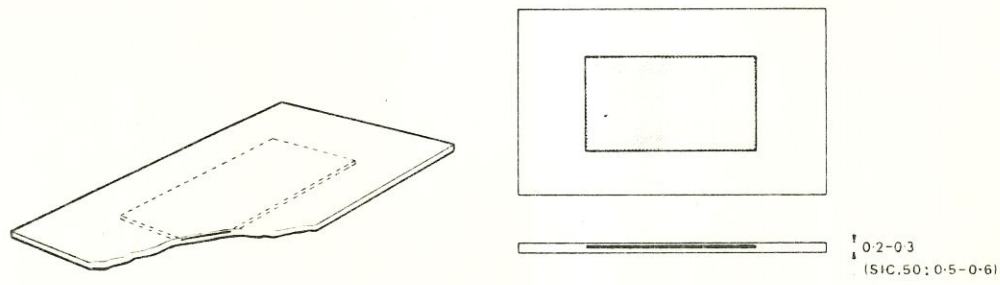


Figure 34

Extended area sources (circular)

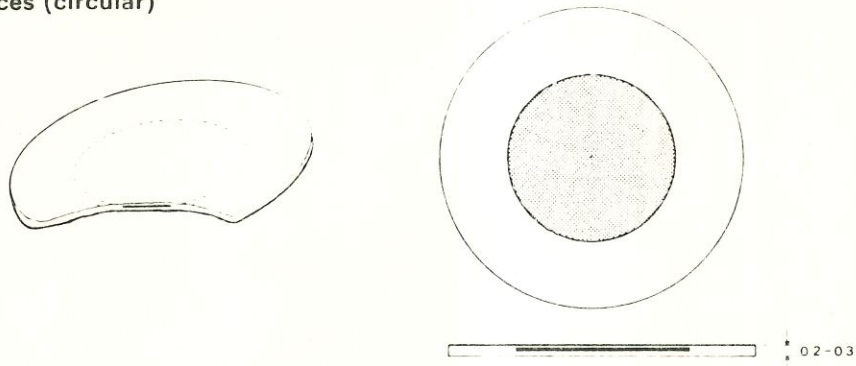


Figure 34a

Point sources

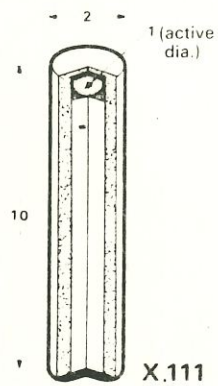


Figure 35

Dimensions in mm

University of Pennsylvania
Radiation Safety Office
191 Towne Building D-3

To: Approved Users of Radioisotopes
From: John W. Thomas
Date: May 22, 1981
Subject: Results of NRC Inspection: Instruction of Personnel

During an NRC inspection of the University's Radiation Safety Compliance, several violations were found stemming from inadequate instruction of individuals using radionuclides under supervision of "approved users".
Specifically:

A lab member put an empty radioactive material shipping container in normal trash. The person had not been instructed that prior to such disposal, the container must be monitored to assess freedom from contamination. Further, the person had not been instructed that the radioactive material labeling must be defaced prior to such disposal. The lab supervisor was aware of these regulatory/license requirements but had not fully instructed the concerned personnel.

This memo is part of our corrective action for the cited violation. All responsible, approved supervisors are reminded of their instructional responsibilities with regard to all persons involved with radiation sources under their aegis. These responsibilities are discussed in the Radiation Safety Guide, University of Pennsylvania. Details of such instruction should include surveying, monitoring, waste disposal, protective garments, lab practices re pipetting and other precautions, records requirements, as well as the more general description of information to be covered as described in the Radiation Safety Guide. It is very desirable that a log be kept clearly showing who has received required instruction, on what date, and any "continuing orientations" practiced.

Dr. S. Fleming

181 Museum F-1

Waste Information - '81

A major change regarding certain ^{14}C and ^3H radioactive waste has been passed by the U.S.N.R.C. This change was proposed in October, 1980 and became effective on March 11, 1981. (An unusually rapid action!).

Under the amended regulation, liquid scintillation media and animal carcasses containing not more than 50 nanocuries of activity per gram ($0.05 \mu\text{Ci/gm}$) may be disposed of as if they were not radioactive. The waste still must be disposed of in accord with local, state or federal regulations governing solvents/biologicals. Scintillation media and carcasses containing any other radionuclides must continue to be treated as radioactive waste. Animal carcass disposal must be by a means assuring the carcass does not come into use as "food for humans or as animal feed".

Under this new regulation, all users of radioactivity will be required to segregate their liquid scintillation media wastes into two types:

a) ^{14}C and/or ^3H only

b) Other nuclide content

The ^{14}C and ^3H waste may be disposed of via chemical disposal channels. The other scintillation waste will be disposed of as in the past. Specific instructions regarding packaging and final disposal of ^{14}C and ^3H liquid scintillation wastes to be disposed of commercially await clarification of a difference between these new NRC regulations and regulations of the Department of Transportation. We will advise further in this regard as soon as this is clarified and we have coordinated procedures with the several institutions in our radiation safety program.

With regard to animal carcasses - N.B., carcasses only - users must clearly establish and document that the carcasses contain no more than 50 nanocuries of any combination of ^{14}C and ^3H per gram and that the actual disposal means utilized precludes use as food or feed. Carcasses containing higher concentrations or other nuclides must be disposed of as in the past. Again, we will provide further information on disposal options as soon as we can clarify.

The amended regulations also increase institutional limits on ^{14}C and ^3H disposed of via the sewer system. If you need revision of your sewer limits as currently established, please ask us to review them. A realistic estimate of your laboratory's water consumption per week or month should be provided.

Lastly, our new waste packaging area, which will permit compaction to reduce volume and hence moderate increasing costs is slowly approaching the start of construction. Current waste costs average about \$125/drum for dry solids; \$145/drum for liquid scintillation media and higher for animal carcasses. A direct price increase of about \$60. to \$80. a drum is anticipated. Hopefully, compaction will approximately balance the projected increase.

John W Thomas
John W. Thomas
Radiation Safety Physicist
4/2/81

UNIVERSITY INTRAMURAL CORRESPONDENCE

June 16, 1980

Dr. Stuart Fleming
181 Museum, F-1

Dear Dr. Fleming:

According to our records you have on loan from our office three small alpha sources. The sources are depleted uranium in a glaze on approximately 4 cm diameter ceramic disks.

These sources have been in your lab for over a year, and we would like them returned if you are finished with them. If you need these sources for your work please let us know how much longer you will want them.

Sincerely

Joseph M. McCue
Joseph M. McCue
Radiation Safety Physicist

JMM/mvw

Joe:
We are calibrating a Ge(Li) detector with these, so I would appreciate holding them until September

6/18/80

University of Pennsylvania Radiation Safety Office 191 Towns Bldg. D-3

REMINDER OF RECORDS DUE

DR. STUART FLEMING
MASCA.
UNIVERSITY MUSEUM F-1

2nd. copy

Sent	Received
9-20-79	10-4

INSTRUCTIONS: Please complete items I through III for the appropriate period and return to the Radiation Safety Office WITHIN 2 WEEKS.

RECORDS DUE

Records are due for the latest period checked:	Jan. 1 through Mar. 31 Apr. 1 through June 30	July 1 through Sept. 30 Oct. 1 through Dec. 31
--	--	---

I. Personnel: Our records show the personnel listed below as working with radioisotopes under your license(s). Please correct as needed.

Stuart Fleming
Patrick McGovern
Stephen Epstein

II. Monitoring performed by Licensee: Give dates, describe surveys, and indicate results. Use reverse side of this page if additional space is needed.

DATE	AREA SURVEYED	SURVEY METHOD	RESULTS
.....
.....
.....
.....
.....
.....
.....
.....
.....
.....

III. Record of Radioisotopes Receipt and Disposition. Provide p

RECORDS OF RADIOACTIVE MATERIAL RECEIPTS AND DISPOSITION

Sealed Sources

LICENSEE DR STUART FLEMING

DEPARTMENT MASCA UNIV. MUSEUM ISOTOPES

Am-241 Sr-90 1/204-Ci
Gamma Ref Sources

First Quarter - January 1 through March 31

Beginning Inventories		Receipts this Quarter	Disposition			Ending Inventory as of March 31
Isotope	Amount mCi		Via Sewer mCi	Via Decay mCi	Other Specify mCi	
241 Am 3 pcs 1010 each						0.030
Sr90						20.0 2.0 0.2
GAMMA RAY SET 9 pcs						0.100
TOTAL						
Report Compiled By _____						Date _____

Second Quarter - April through June

Beginning Inventories		Receipts this Quarter	Disposition			Ending Inventory as of June 30
Isotope	Amount TOTAL mCi		Via Sewer mCi	Via Decay mCi	Other Specify mCi	
241 Am 3 pcs	0.030	0.030				0.030
Sr90 3 pcs	20.0 2.0 0.2	0.2				0.2
GAMMA SET 9 pcs	0.100	0.100				0.100
Report Compiled By <u>Paul Fleming</u>						Date <u>MAY 15, 79</u>

Third Quarter - July 1 through September 30

Beginning Inventories		Receipts this Quarter	Disposition			Ending Inventory as of September 30
Isotope	Amount mCi		Via Sewer mCi	Via Decay mCi	Other Specify mCi	
241 Am 3 pcs	0.030					0.030
Sr90		20.0 2.0				20.0 2.0 0.2
Gamma Set 9 pcs	0.100					0.1
Report Compiled By <u>Paul Fleming</u>						Date <u>DEC 6, 79</u>

Fourth Quarter - October 1 through December 31

Beginning Inventories		Receipts this Quarter	Disposition			Ending Inventory as of December 31
Isotope	Amount mCi		Via Sewer mCi	Via Decay mCi	Other Specify mCi	
241 Am (3 pcs)	0.030					0.030
Sr90	20.0 2.0 0.2					20.0 2.0 0.2
Gamma Set 9 pcs	0.1					0.1
Report Compiled By _____						Date _____

RSP-2r

RECORDS OF RADIOACTIVE MATERIAL RECEIPTS AND DISPOSITIONS

Page 2 of _____ pages

Licensee: Dr. Stuart Fleming

Department: MASCA

Isotopes: Am-241 Sr-90 Gamma Ref.

First Quarter - Jan. 1 through March 31

Beginning Inventories as of Jan. 1		Receipts this Quarter	DISPOSITION			Ending Inventory as of March 31
Isotope	Am't mCi		Via Sewer mCi	Via Decay mCi	Other Specify mCi	
Am-241	0.03					
Sr-90	22.2					
Gamma Ref Source	0.1					

Report for this Quarter Compiled by _____ and returned to the Radiation Safety Office on _____

Second Quarter - April 1 through June 30

Beginning Inventories as of April 1		Receipts this Quarter	DISPOSITION			Ending Inventory as of June 30
Isotope	Am't mCi		Via Sewer mCi	Via Decay mCi	Other Specify mCi	

Report for this Quarter Compiled by _____ and returned to the Radiation Safety Office on _____

Third Quarter - July 1 through September 30

Beginning Inventories as of July 1		Receipts this Quarter	DISPOSITION			Ending Inventory as of September 30
Isotope	Am't mCi		Via Sewer mCi	Via Decay mCi	Other Specify mCi	

Report for this Quarter Compiled by _____ and returned to the Radiation Safety Office on _____

Fourth Quarter - October 1 through December 31

Beginning Inventories as of October 1		Receipts this Quarter	DISPOSITION			Ending Inventory as of December 31
Isotope	Am't mCi		Via Sewer mCi	Via Decay mCi	Other Specify mCi	

Report for this Quarter Compiled by _____ and returned to the Radiation Safety Office on _____

UNIVERSITY OF PENNSYLVANIA
Radiation Safety Office
191 Towne Building, D-3

Monitoring report #: MU-2-D

Survey
Dates: 12/6/79 and 2/15/80

Monitoring Performed by: William C. Hoffman

Area Surveyed: Room 182, 185 Sealed Sources

Responsible Investigator: Dr. Stuart Fleming

Isotopes Used: None To Date

Purpose: _____

RESULTS:

Description: A complete description of this facility is on file with this report in the Radiation Safety Office. The facility is adequate for the proposed work.

Isotope Storage: All sources are stored in room 185. The larger sources (Sr-90) are stored in lead shields under the bench. The Am-241 and the reference standards are stored in a locked file cabinet.

Radioactive Waste Disposal: None Expected. Final disposition of these sources will be coordinated via the Radiation Safety Office.

Licensee Survey and Record Keeping Methods: A complete inventory of these sources is on file with the Radiation Safety Office. Dr. Fleming inventories these sources each time he performs the leak test. Dr. Fleming takes the test samples and returns them to the Radiation Safety Office for assay along with the inventory record. The alpha sources (Am-241) are tested at intervals not exceeding three months and the other sources are tested during January, May and September.

Radiation Signs and Labels: The area was properly posted and the storage containers were properly labelled.

Results of this Survey: (Only (b) below was done during both surveys.)

- a) The sources were leak tested by Dr. Fleming and Mr. Hoffman. No evidence of source leakage was detected. The samples were counted in the appropriate counters in a manner capable of detecting less than 0.0005uCi of activity on the test samples.
- b) Radiation levels were measured outside the storage areas. A Victoreen 440 and a GM tube survey meter were used. No levels above background were found.
- c) On reverse side.

Reviewed by: Joseph M. McCue

Surveyed by: William C. Hoffman

c) Radiation levels were measured during the leak testing procedure. Dr. Fleming knows how to properly leak test the sources without exposing himself to unnecessary radiation and without damaging the alpha sources.

Comments:

No items of noncompliance with conditions of licensing were found.

FOR USE WITHIN THE UNIVERSITY OF PENNSYLVANIA ONLY

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

INSTRUCTIONS: Complete all items for each application. Items may be completed by referring to earlier applications made on this form which are on file in the Radiation Safety Office. (Items 1, 2, 3, 4, 5, 6(a), 6(c), 7, 8(a), 10(a), 10(b), 12, 13, 15, 16, 17, 18, appear on AEC application form 313.)

1. (a) NAME AND SHIPPING ADDRESS OF APPLICANT (Institution, firm, hospital, person, etc.)
 MASCA, The University Museum
 Philadelphia, PA 19104

(b) ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED (If different from shipping address)
 Same as (a)

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Thermoluminescence Section (Rooms 182, 185)

3. INDIVIDUAL USER (Name and title of individual(s) who will use or directly supervise use of byproduct material)

Dr. Stuart Fleming, Scientific Director

4. RADIOLOGICAL SAFETY OFFICER (Name of person qualified in radiological safety, if other than individual user)

as above

5. PREVIOUS LICENSE OR AUTHORIZATION NUMBER (If this is an application for renewal of a license for byproduct material obtained under a prior license or authorization for radioisotope procurement)

BYPRODUCT MATERIAL OR IRRADIATION SERVICE DESIRED

6. (a) BYPRODUCT MATERIAL (Element and mass number)
 Thallium-204
 Strontium-90
 Americium-241
 Gamma reference

(b) CHEMICAL AND/OR PHYSICAL FORM (Or catalog number)
 TEC 3
 SIF 25
 AMR 2401, AMM4
 QCR 2

(c) HALF LIFE
 3.78 years
 28.5 years
 433 years
 various

7. IF IRRADIATION SERVICE IS DESIRED, STATE PERTINENT DETAILS SUCH AS: CHEMICAL COMPOSITION AND WEIGHT IN GRAMS OF TARGET MATERIAL, RADIOACTIVITY, IRRADIATION TIME IN DAYS, AND NEUTRON FLUX

N/A

8. (a) MAXIMUM AMOUNT OF BYPRODUCT MATERIAL IN MILLICURIES YOU WILL POSSESS AT ANY ONE TIME

Am-241, 100 μ Ci Sr-90, 44 mCi Tl-204, 20 mCi

(b) ESTIMATED YEARLY AMOUNT NEEDED

Constant

(c) ESTIMATED MAXIMUM AMOUNTS TO BE USED PER EXPERIMENT AND FREQUENCY OF EXPERIMENTS

Sealed sources used daily; see attached for specific source sizes.

CERTIFICATE

THE UNDERSIGNED HAS READ "THE RADIATION SAFETY GUIDE, UNIVERSITY OF PENNSYLVANIA" AND ACCEPTS HIS RESPONSIBILITIES AS A USER OF RADIOISOTOPES AS DESCRIBED THEREIN.

8 November 1978

(Date)

(Signature of applicant)

THE RADIATION SAFETY COMMITTEE APPROVES THIS APPLICATION

(Signature of Committee Chairman or his authorized representative)

(Signature of Committee Chairman of the Hospital of the University of Pennsylvania or his authorized representative)

UNIVERSITY OF PENNSYLVANIA

LICENSE NUMBER 906 Subject to Annual Review

EXPIRATION DATE _____

9. TYPE OF EMISSION	ENERGY IN MEV AND % OCCURRENCE PER DISINTEGRATION	RANGE OR HALF VALUE LAYER IN		
		Al	Pb	or Al
Beta (Tl-204)	0.76 MeV	280 mg/ Cm^2		1 mm
Beta (Sr-90)	2.27 MeV	1100 mg/ Cm^2		2 mm
Alpha (Am-241)	5.46 MeV (+ x-rays)			15 μ m
Gamma (References)	Up to 2.73 MeV			1 m (approx)

10. (a) DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED (Use Supplement A for human use, Supplement B for sealed sources)

TE 3, SIF 45, AMM 4: Irradiation of pottery samples.

AMR 2401: Calibration source for alpha-counting (ZnS scintillation)

(b) EVALUATE POTENTIAL HAZARDS FROM HANDLING AND STORAGE OF BYPRODUCT MATERIAL AND DESCRIBE PROCEDURES PLANNED TO MINIMIZE THEM (Include survey and monitoring plans)

Store locked: (i) regular visual inspection of source's surface for alpha sources.

(ii) Wipe test for beta sources and mirror inspection of source face.

See attached

(c) WHAT IS THE RADIOTOXICITY OF THIS MATERIAL? (metabolism, etc.)

Sr-90, Am-241 are bone seekers, with MPBB of 2 μ Ci and 0.05 μ Ci
 Tl-204 has a MPBB of 10 μ Ci with the kidney as the critical organ.

(d) WHAT RADIOACTIVE WASTES ARE EXPECTED IN THIS WORK AND DESCRIBE PROPOSED METHODS OF DISPOSAL

None

11. (a) LIST PERSONNEL WHO WILL WORK ON THIS PROJECT AND ESTIMATE AS WELL AS POSSIBLE MAXIMUM LEVEL OF RADIATION EXPOSURE FOR EACH

Stuart Fleming (Scientific Director)

Howard Robkoff (Research Specialist)

Stephen Epstein (Research Fellow)

} Exposure near zero

11. (b) LIST ANY OTHER AREAS AND PERSONNEL THAT OCCUPY THEM WHERE EXPOSURE TO FIELDS IN EXCESS OF 1 MR/HOUR IS POSSIBLE FROM THIS WORK

None

TRAINING AND EXPERIENCE WITH RADIOACTIVITY OF INDIVIDUAL USER NAMED IN ITEM 3

If Radiological Safety Officer named in Item 4 is different from individual user, or if there is more than one individual user, use supplementary sheet to provide equivalent information to that requested in Items 12 and 13 for this (these) person(s).

12. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
Stuart Fleming				
a. Principles and practices of radiation protection	Oxford University, England	14 yrs.	Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation	None		Yes No	Yes No

13. ISOTOPE HANDLING EXPERIENCE

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
Am-241	10 mCi	Oxford University	12 years	Powder matrix and foil source
Sr-90	200 mCi		14 years	Sealed source
Tl-204	40 mCi		12 years	Sealed source

PHYSICAL FACILITIES, EQUIPMENT, AND RADIATION INSTRUMENTATION

14. RADIATION DETECTION INSTRUMENTS (Use separate sheet if necessary)

TYPE OF INSTRUMENTS (include make and model of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm ²)	USE (Monitoring, surveying, measuring)
6M Survey Meter	1			1.4 mgCm	monitoring
TL Dosimetry	2	gamma alpha beta			

15. FILM BADGES, DOSIMETERS, AND OTHER PERSONNEL MONITORING DEVICES INCLUDING BIO-ASSAY PROCEDURES

Applied for.

16. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE (For film badges specify method of calibration and processing, or name supplier)

Monthly.

17. (a) DESCRIBE BRIEFLY REMOTE HANDLING EQUIPMENT, STORAGE CONTAINERS, SHIELDING, AND LABORATORY FACILITIES (Working areas, fume hoods, etc.)

. Dessicator storage.

(b) SKETCHES OF SUCH FACILITIES ARE ATTACHED (Circle answer) YES NO

*** Howard Robkoff and Stephen Epstein are familiar with the irradiation hazards associated with x-rays, but have not yet used either alpha or beta sources.

Dr. Fleming, License #906

Hazard Evaluation

Ref: 8C

Am-241 - Individual sources will not exceed 20 microcuries

Sr-90 - Individual sources will not exceed 20 millicuries.

Tl-204 - Individual sources will not exceed 20 millicuries

Gamma Reference Sources:

All 10 microcuries except Hg-203 which is 20 microcuries.
See attached page 41 from Amersham's catalog.

Ref: 10 b

- a) The Am²⁴¹ is an alpha source which has a very minor low energy gamma that will not present any problems at this level of activity. This source would be a hazard only if the Am-241 would come loose and contaminate personnel. Leak testing will be done at intervals not exceeding 3 months.
- b) The Sr-90 sources are high energy beta sources which have a very high dose rate at the face of the source--up to 25 rads per second at contact with the 20 mCi sources. The source design is such that the dose rate is very low except at the face of the source. The source will always be handled from the back and shielding with low Z material will be employed. One-half inch of plastic makes a suitable shield.
- c) The Tl-204 is similar to the Sr-90 source except that it will have a beta emission which has about one-third the energy of the Sr-90 source. One-quarter inch plastic makes a suitable shield.
- d) Both Sr-90 and Tl-204 sources will be leak tested by wipe test using remote shielded equipment. Testing will be at intervals not exceeding six months. Should leak testing show removable activity exceeding 0.005 μ Ci, the Radiation Safety Office will be notified immediately.
- e) Personnel will be specifically instructed concerning the radiation levels produced by the individual sources and will be instructed in handling, shielding and monitoring techniques.



Applied Science Center for Archaeology

THE UNIVERSITY MUSEUM • UNIVERSITY OF PENNSYLVANIA
33rd & SPRUCE STREETS • PHILADELPHIA 4, PENNSYLVANIA
Froelich Rainey, Director EVERgreen 6-7400 (Area code 215)
Elizabeth K. Ralph, Associate Director
EVERgreen 6-0100 Ext. 8168 (Area code 215)
Cable Address "Antique"

Technical Services Division
Amersham
Amersham Corporation
2636 S. Clearbrook Dr.,
Arlington Heights, IL 60005

October 31, 1978

Dear Sirs:

I would appreciate further details on the procedures used in Emanation tests E and K as mentioned in your catalogue and fuller data on your radium-226 emanating sources particularly with respect to its safe handling and storage.

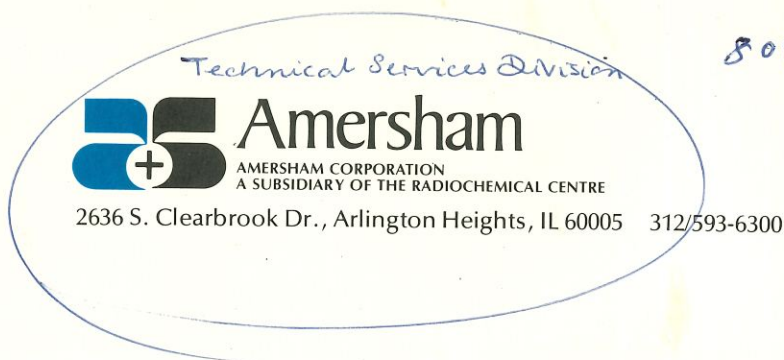
Additionally could you please supply me the appropriate Technical Bulletin on your various low energy photon sources, particularly the strontium -90 Bremsstrahlung form.

Also, I wish to purchase three 10 micro Curie americum-241 sources in foil-form mounted as a disc. I understand that a variety of such sources are in regular production and, since I can be quite flexible over the source dimensions (active areas of diameter between 1-2 cm are preferred) I would like to know what is currently in stock.

Prompt response to these queries would be appreciated.

Yours Sincerely,

S.J. Fleming
Scientific Director



September 1978

STANDARDIZED RADIOACTIVE SOLUTIONS

Standardized solutions of the following radionuclides will be available during October 1978 - January 1979 according to the schedule:

<u>October</u>	<u>November</u>	<u>December</u>	<u>January</u>
Gold-198	Barium-140	Calcium-45	Cadmium-109
Iodine-125	Cerium-141	Phosphorus-32	Cerium-139
Niobium-95	Iodine-131	Selenium-75	Phosphorus-32
Phosphorus-32	Strontium-89	Thulium-170	Strontium-85
Polonium-210	Sulphur-35	Yttrium-88	
Silver-110m	Zirconium-95		
Mixed Radionuclide Standard			

Special Preparations

A special preparation of calcium-47 (calibration accuracy \pm 3% or better) will be prepared for delivery in October 1978 and of mercury-197 (calibration accuracy \pm 4% or better) for delivery in March 1979.

Recently Introduced Standardized Solutions

Carbon-14 is now available from stock as a standardized solution of glucose in water with an overall uncertainty of \pm 2%. The solution contains 1 mg of glucose and 1 mg of formaldehyde per ml of solution. Two radioactive concentrations can be supplied:

code CFZ.64 2MBq (54 μ Ci) in 5 ml
and code CFZ.44 200kBq (5.4 μ Ci) in 5 ml

The following standardized solutions, previously available once or twice a year, are now available from stock:-

Cerium-144	codes	CHZ.72	CHZ.64	CHZ.44
Cobalt-57	codes	CTZ.72	CTZ.64	CTZ.44
Manganese-54	codes	MFZ.72	MFZ.64	MFZ.44
Ruthenium-106	codes	RKZ.72	RKZ.64	RKZ.44
Zinc-65	codes	ZAZ.72	ZAZ.64	ZAZ.44

Ordering

Orders for any of the above standardized solutions should be placed by the first day of the month in which the solutions are shown to be available (standardized solutions of zirconium-95 should be ordered by 1 October 1978). Late orders will be accepted subject to availability.

Call Customer Service toll free (800) 323-9750 to place orders or enquire further about these products. In Illinois call (312) 364-7100. In Alaska, Hawaii and Puerto Rico call (312) 593-6300. In Canada call toll free 1-(800) 265-5061.

UNIVERSITY INTRAMURAL CORRESPONDENCE

May 8, 1979

Dr. Stewart Fleming
185 Univ. Museum F-1

Dear Dr. Fleming:

Enclosed you will find forms and materials for leak testing the sealed sources now in your possession. We would like to have someone from our office present when the initial leak testing is done.

Please note that we have transferred the C-14 source formerly under Dr. E. Ralph's name to yours and have included it on your leak test list.

Please call our office at ext. 7187 as soon as possible to arrange a date and time to perform these tests.

Sincerely,

Randi S. Hochman
Randi S. Hochman
Radiation Safety Office

ENCL.

UNIVERSITY of PENNSYLVANIA

PHILADELPHIA 19174

Radiation Safety Committee

March 26, 1979

Dr. Stuart Fleming
MASCA
University Museum, F-1

Dear Dr. Fleming:

The Radiation Safety Committee has approved your request to possess and use byproduct material as described on the enclosed University of Pennsylvania License #906. To provide a simple reference giving the scope of this license, we have prepared a summary, a copy of which is enclosed.

If you have any questions concerning the license or if our summary does not properly outline this use of radioactivity, please let us know promptly.

Sincerely yours

Joseph M. McCue
Joseph M. McCue
Radiation Safety Physicist

JMM/mvw
Enc.

UNIVERSITY OF PENNSYLVANIA
RADIATION SAFETY OFFICE
191 TOWNE BUILDING

SUMMARY OF RADIOISOTOPE LICENSE

Licenses are reviewed approximately once a year and new summaries issued. Please discard all summaries of this license dated before March 15, 1979.

Licensee: Dr. Stuart Fleming

License No. 906

Department: MASCA, University Museum

Building and Room No.	Radio-Nuclide(s)	Limits or Amounts				Sealed Sources used Daily
		mCi Poss'n.	mCi Annual	Experimental		
				Per Vessel	Total Exp. Frequency	
University Museum Rms 182, 185	Am-241	0.100	0.100	20 μ Ci		
	Sr-90	44.0	44.0	20 mCi		
	Tl-204	20.0	20.0	5 mCi		
	Gamma Reference Sources		20 μ Ci max. per source			

Use - Irradiation of pottery samples.

Calibration source for alpha counting.

Waste - None expected.

UNIVERSITY OF PENNSYLVANIA RADIATION SAFETY OFFICE ROOM 191 TOWNE BUILDING
INVENTORY AND LEAK TEST OF SEALED RADIOACTIVE SOURCES

LICENSEE: Dr. Stuart Fleming

DATE SENT: 5-8-79

The sealed sources listed below are due to be leak tested during the months of January, May and September. Please take the leak test sample with the enclosed materials as indicated in item I, complete items II and III for the appropriate test period, sign and return this form and the test samples to our office by the 20th of the month.

I.

Source Description and Location	Sample Ident.	Microcuries on Test Sample			CCDE
		Jan.	May	Sept.	
Am ²⁴¹ 10 μ Ci 185 Mus.	18-A				
Am ²⁴¹ 10 μ Ci 185 Mus.	18-B				
Am ²⁴¹ 10 μ Ci 185 Mus.	18-C				
Sr ⁹⁰ 20 mCi 185 Mus.	18-D				
Sr ⁹⁰ 2 mCi 185 Mus.	18-E				
Sr ⁹⁰ 200 μ Ci 185 Mus.	18-F				
Tl ²⁰⁴ 20 mCi 185 Mus.	18-G				
C ¹⁴ 3 mCi 185 Mus.	18-H				

II. The source description and location information listed above is correct, Jan. (), May (), Sept. (). If incorrect note changes on reverse side.

III. Signature(s) of person(s) who took Leak tests and/or completed forms.

	Form	Test
Jan.
May
Sept.

TO BE COMPLETED BY THE RADIATION SAFETY OFFICE

The above samples were counted and activity computed by the methods per CCDE column

on _____ L.T. number _____ by _____

UNIVERSITY of PENNSYLVANIA

PHILADELPHIA 19174

Radiation Safety Committee

May 15, 1979

Dr. Stuart Fleming
MASCA
University Museum, F-1

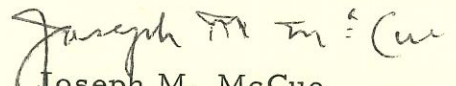
Dear Dr. Fleming:

Dr. Ralph has requested that the ^{14}C light source formerly under her License #299 be transferred to your license #906. This will minimize the paperwork as all work at MASCA will be under one license.

To provide a simple reference giving the scope of the amended license, we have prepared a summary, a copy of which is enclosed.

If you have any questions concerning the amended license, or if our summary does not properly outline this use of radioactivity, please let us know promptly.

Sincerely,


Joseph M. McCue
Radiation Safety Physicist

JMM/mvw
Enc.