Wright 367

VICTOR J. BORTOLOT 37 North Street North Branford, CT 06471 (203) 481-3970

December 13, 1976

Mr. Earl G. Wright
U.S. Nuclear Regulatory Commission
Radioisotopes Licensing Branch
Division of Fuel Cycle and Material Safety
Washington, D.C. 20555

Dear Mr. Wright;

This letter is intended to clarify several points in my application (control no. 84200) raised in your letter of November 24, 1976. My responses will follow your numbering.

1. The americium-241 source is ICN model 74101. The number given in the application was that of the capsule type. The source will be stored and used in a shield fixture as shown in Figure 1. The 60 KeV gamma component will be used as a calibration for TLD personnel monitoring. The surface exposure rate on the device is anticipated to be less than 1 mR/hr. A wipe test on the exposure device will be made every three months when the source is in use.

2a. The 100 mCi strontium-90 source (ICN 75120) will be stored and used in a shielded device having a solenoid operated spring return shutter. This will guard against mechanical damage and prevent personal contact with the source. A drawing of the proposed device is shown in Figure 2.

A survey was made to determine optimum shutter composition and thickness, given the exposure geometry required. A source identical to the one applied for was located at Yale-New Haven Hospital and was used for this survey. The results have been corrected to a present 100 mCi activity. The source was viewed through various absorbers by an Eberline RO-1 ionization-type survey meter in contact with the absorbing material. The chamber center is 1.75" behind its front surface.

A composite shutter consisting of 1/16" aluminum and 3/16" lead was judged most effective in reducing brehmstralung production and then absorbing it. In the survey geometry described, the exposure rate was 45 mR/hr. The actual device will have a spacing ring which will prevent approach closer than about ½" to the brehmstralung-producing region of the shutter. I estimate that the actual exposure rate at the bottom of this ring will be no more than 100 mR/hr. When not in use, this assembly will sit on a 2" lead brick. The exit exposure rate will be under 10 mR/hr.

The top and sides of the source capsule will likewise be shielded. A ½" layer of lead reduced the top or side exposure rate to 12 mR/hr. Approximately 1" lead will be used.

By way of comparison, the maximum exposure rate measured at the surface of the source storage box (it is a medical eye applicator) was 13 mR/hr. Thus, in terms of surface radiation, the proposed exposure device, when placed on its lead block, should be similar to the standard eye applicator storage box.

Considering the expected levels of radiation, and the degree of protection afforded the source, a survey meter should not be required during routine use. A survey will, however, be made when the device is built and the source first installed.

The expected use of the source should be less than 500 hours per year. A layout of the TL lab is shown in Figure 3.

2b. Source protection is described above. According to the manufacturer, the source is robust, having a double stainless steel encapsulation. The activity is incorporated in a rolled silver layer. This sealed source qualifies as special form material.

2c. The presence of a survey meter during routine use of the source is judged unnecessary, as argued above.

2d. An expanded description of personnel monitoring program. The TL phosphor to be used in the monitor badges is Harshaw LiF-7 material, 1/8" X 1/8" X 0.035", three per badge. The badge will be an opaque delrin capsule with ¼" walls. There will be no post-readout annealing, only the natural cooling from 400°c under nitrogen in the readout instrument sample oven.

The readout instrument has been constructed by the applicant. It consists of an evacuable sample oven with prepurified nitrogen purge, a temperature controller with linear temperature ramp (0-50°C/sec) to 500°C and automatic background glowcycle, an EMI 9635B PMT and single photon counting signal chain (full scale ranges 5×10^2 - 2×10^6 photons/sec.), and an X-Y recorder.

An earlier version of this instrument has been in use at Mt. Sinai School of Medicine, New York City, for about 4 years. Typical performance is ± 6% precision at 8 mrads with 1/8" sq. LiF-7 dosimeters, and ± 12% at 25 rads with 30 mg $CaSO_4$:Dy powder.

Readout of the personnel monitor will be made monthly when the sources are in use. Calibration will be performed using the americium-241 source applied for. The sample holder well of the exposure device will have a removable 1 mm thick lucite insert with a space underneath for the LiF dosimeters. The lucite acts as an alpha particle absorber and electron

build-up for the 60 KeV gammas.

This gamma source and exposure device will be calibrated as an intercomparison standard with a 10.13 mg. radium capsule (0.5 mm. platinum filtration) at Yale-New Haven Hospital Radiation Therapy Dept., New Haven, CT (Union Miniere du Haut Katanga, certificat no. 19261).

Calibration exposure of 25, 100, and 500 mR will be made to three groups of three "annealed by cooling" LiF dosimeters in $\frac{1}{4}$" wall delrin capsules. An Eberline RO-1 survey meter in integration mode will provide a check on exposure (capsule at chamber center line).

These dosimeters will be read out, exposed to the americium-241 source for various times, then re-read to obtain the exposure rate.

The read-out procedure for monitoring purposes is similar. The three dosimeters in the badge are each read out, exposed to a similar gamma calibration dose, then re-read and replaced in the badge capsule.

2e. Due to the degree of mechanical protection of the source as described above, survey and wipe tests after each use are considered unnecessary.

I hope that these modifications and amplifications meet with your approval. If any further details are required, I would appreciate a speedy reply.

Sincerely yours,

Victor Bortolot

Victor J. Bortolot, Ph.D.

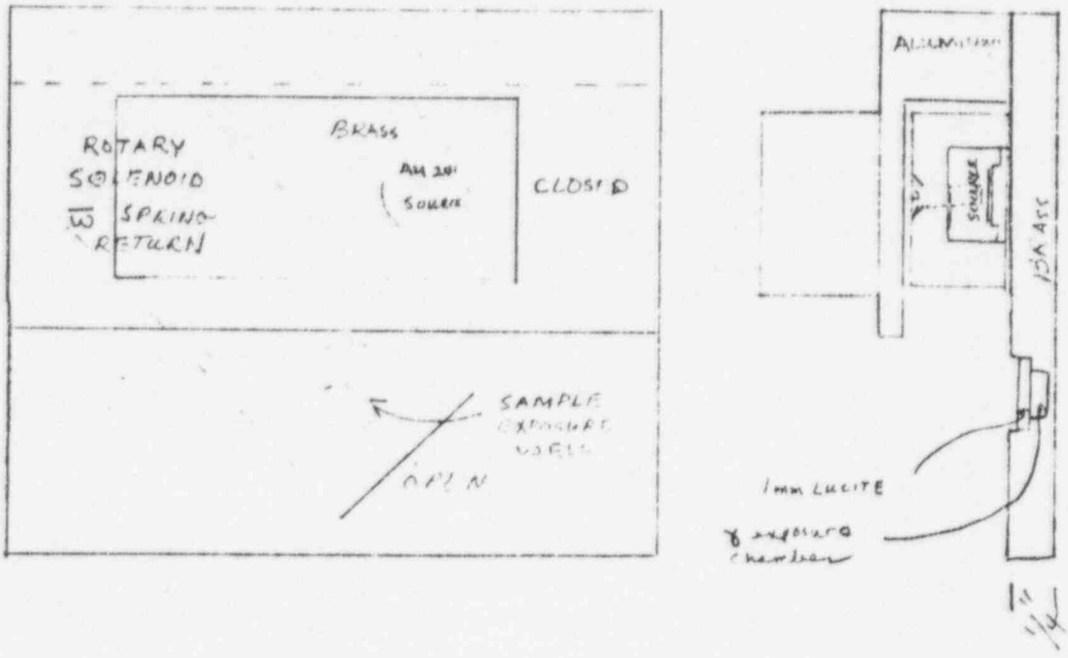
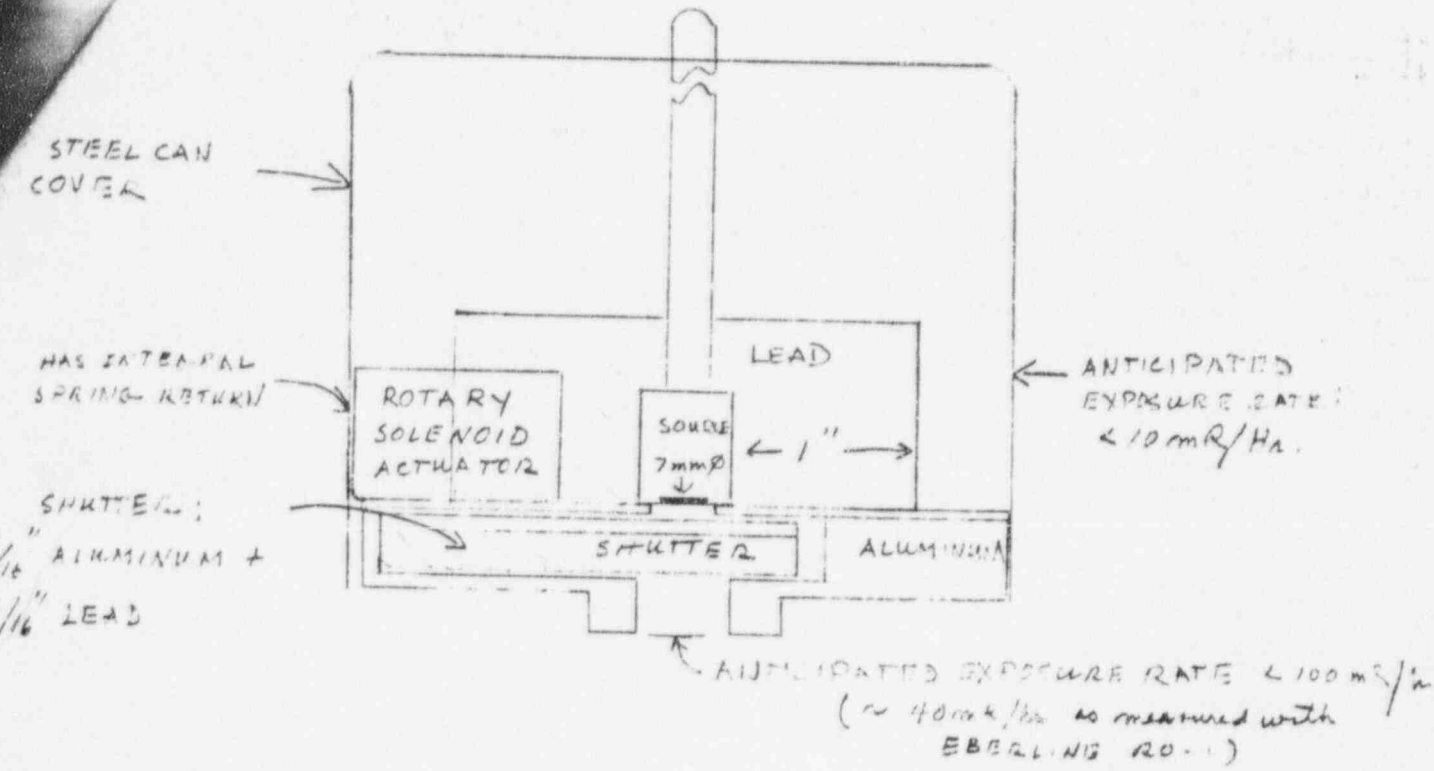


FIGURE 1. Am-241 alpha/gamma exposure device
ANTICIPATED SURFACE EXPOSURE RATE ≤ 1 mR/hr.



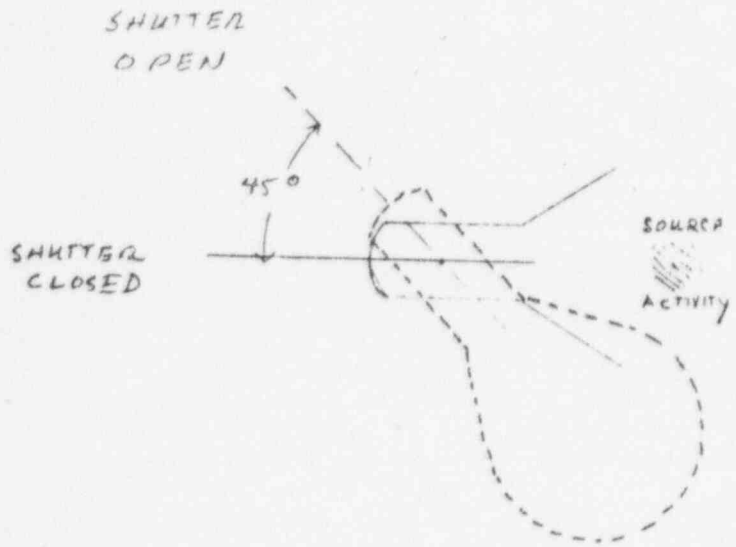
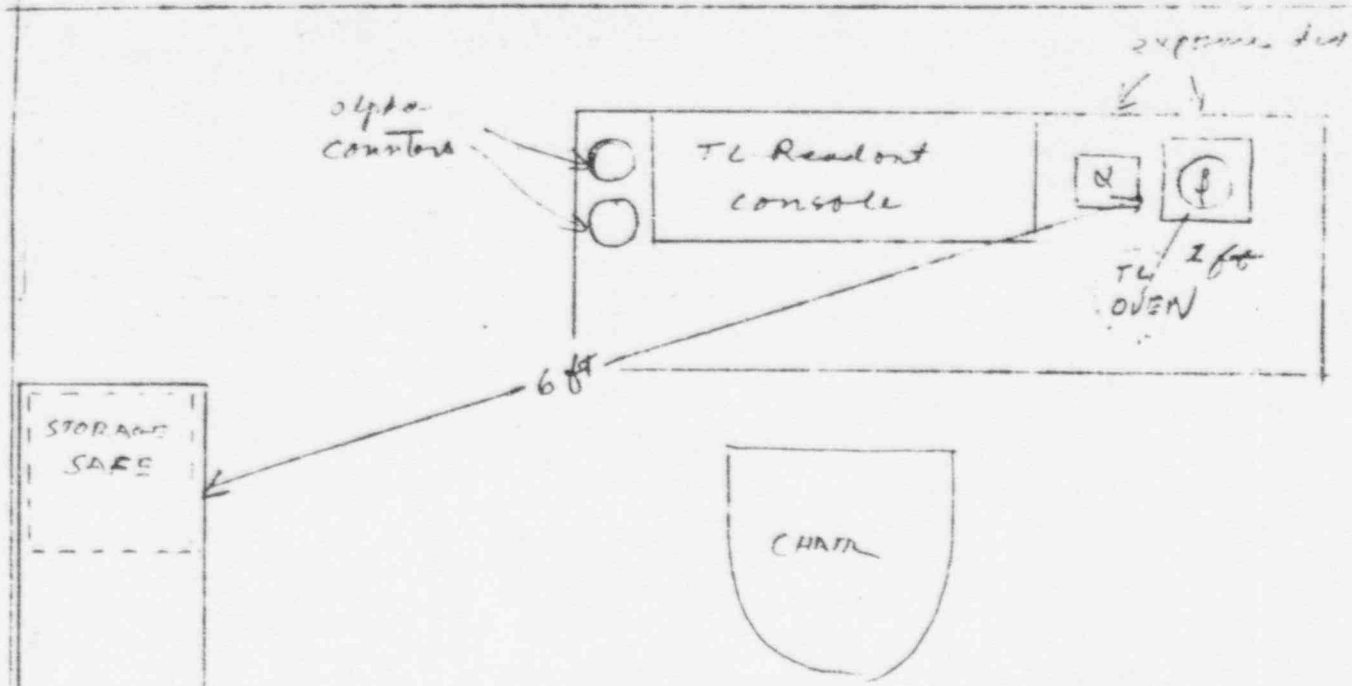


FIGURE 2. Sr^{90} SHIELDED EXPOSURE DEVICE, ACTUAL SIZE.

WHEN NOT IN USE, DEVICE WILL SIT ON 2" LEAD BRICK.

WHEN IN USE, DEVICE WILL SIT ON TL RADON OVEN (~ 1" ALUMINUM).

TL LAB. LAYOUT



DOOR

SAMPLE PREP AREA

1976 Application (3)

Form AEC-313 (2-73) 10 CFR 30

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved Budget Bureau No. 38-R0027

INSTRUCTIONS —Complete Items 1 through 16 if this is an initial application or an application for renewal of a license. Information contained in previous applications filed with the Commission with respect to Items 8 through 15 may be incorporated by reference provided *references are clear and specific*. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: U.S. Atomic Energy Commission, Washington, D.C., 20545, Attention: Materials Branch, Directorate of Licensing. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20, and the license fee provisions of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 16 and the appropriate fee enclosed. (See Note in Instruction Sheet).

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital person, etc. Include ZIP Code and telephone number.)*

Victor J. Bortolot Ph.D.
Consulting Physicist
37 North St.
North Branford, CT 06471
(203) 481-3970

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1(a). Include ZIP Code.)*

Wat L 17253

030-12440

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Thermoluminescence Laboratory

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

RECEIVED BY LFMB
Date. 10. 21. 76

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

Victor J. Bortolot, Ph.D.

5. RADIATION PROTECTION OFFICER. *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and expetience as in Items 8 and 9.)*

By... Wilson
From... files
Cy to...
Action Compl.. 10.21.76

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*

(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*

Strontium-90	1 sealed source, 100 mCi ICN model 75129 (BS capsule)	100 mCi
Americium-241	1 sealed source, 1 mCi ICN model 1111	1 mCi

COPIES SENT TO OFF. OF INSPECTION AND ENFORCEMENT

Applicant..... 1 mCi
Check No.. 101
Amount.. $50.00
Date of Check.. 10.14.76
Date Check Rec'd.. 10.21.76
Received By.. CWISS

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)* The two sealed sources listed above will be used in the thermoluminescence sensitivity calibration of ceramic materials for the purpose of archaeological dating (cf. appended article). The response of geological materials to alpha and beta particles is different and varies greatly from sample to sample, necessitating both alpha and beta calibration curves for each sample examined. Dating is not possible without such data. The sources will be stored in 4 cm wall lead containers and removed manually (about 30 cm distance) to shielded sample exposure jigs of the applicant's manufacture. When the sources are not in use, the containers are to be kept in a fire resistant safe within a locked cabinet.

84200

(Continued on reverse side)

10/76 p.9