Form AEC-313
(8-64)
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: Isotopes Branch, Division of Materials 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.

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

International Nutronics, Inc.
200 Third St.
Los Altos, CA 94022

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

Chase Bag Co.
Mill and Cleveland Streets
Chagrin Falls, OH 44022

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

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

None

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.)*

Karol J. Bialy
John D. Buchanan
Allan Chin

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

John D. Buchanan, Certified Health Physicist

| 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.)* |
|---|---|
| 1) Strontium-90 | 1 sealed source contained in a shielded beta irradiator; 100 Ci or less; Minnesota Mining & Mfg. Co. Model 3M1B. |
| 2) Krypton-85 | 1 sealed source, 5-mCi max., Multronics Model Mx-7338/ PDR-27R. |

Applicant as above
Check No. 3334
Amount $40.00
Date of Check 6-16-71
Date Check Rec'd 6-21-71 - asc

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.)*

1) Strontium-90 irradiator: Study the effects of ionizing radiation on the removal of particulates from a gas stream by electrostatic precipitation. A sample of the stack gas from a coal-fired furnace will be passed through the irradiator. The complete irradiator, Model 3M1B, includes the shielded storage container in which the source will be shipped and used.

2) Krypton-85: Instrument check source.

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8502280537 850212
PDR FOIA
SCUIK85-71 PDR

(Continued on reverse side)

**TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4** *(Use supplemental sheets if necessary)*

| 8. TYPE OF TRAINING | WHERE TRAINED | DURATION OF TRAINING | ON THE JOB (Circle answer) | FORMAL COURSE (Circle answer) |
|---|---|---|---|---|
| a. Principles and practices of radiation protection | SEE | | Yes No | Yes No |
| b. Radioactivity measurement standardization and monitoring techniques and instruments | ATTACHMENTS | | Yes No | Yes No |
| c. Mathematics and calculations basic to the use and measurement of radioactivity | FOR ITEMS | | Yes No | Yes No |
| d. Biological effects of radiation | 8 and 9 | | Yes No | Yes No |

9. EXPERIENCE WITH RADIATION. *(Actual use of radioisotopes or equivalent experience.)*

| ISOTOPE | MAXIMUM AMOUNT | WHERE EXPERIENCE WAS GAINED | DURATION OF EXPERIENCE | TYPE OF USE |
|---|---|---|---|---|
| | | | | |

10. RADIATION DETECTION INSTRUMENTS. *(Use supplemental sheets if necessary.)*

| TYPE OF INSTRUMENTS (Include make and model number of each) | NUMBER AVAILABLE | RADIATION DETECTED | SENSITIVITY RANGE (mr/hr) | WINDOW THICKNESS (mg/cm²) | USE (Monitoring, surveying, measuring) |
|---|---|---|---|---|---|
| Multronics Model AN/PDR-68-27R | 1 | $\beta, \gamma$ | 0-500 | $\leq 1.4$ | Monitoring, surveying |

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE

At least every 3 months using calibrated source range.

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. *(For film badges, specify method of calibrating and processing, or name of supplier.)*

Film badge service by Radiation Detection Co., Mountain View, CA.

**INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS IN DUPLICATE**

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. *(Circle answer)* Yes (No) (see attachment)

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved.

**CERTIFICATE (This item must be completed by applicant)**

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PART 30, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF OUR KNOWLEDGE AND BELIEF.

International Nutronics, Inc.
Applicant named in item 1

Date June 16, 1971

By: John D. Buchanan
John D. Buchanan
Radiation Safety Officer
Title of certifying official

**WARNING.**—18 U. S. C., Section 1001; Act of June 25, 1948, 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

* U.S. GOVERNMENT PRINTING OFFICE : 1968 O—322-213

AEC - 313, Attachments, International Nutronics, Inc.

Application Dated June 16, 1971

13) Facilities and Equipment

The 3M1B irradiator is sealed within a 500 lb. DOT Spec 55 shipping container at all times. The external radiation level is less than 5 mR/hr at 12 inches with 100 Ci of Sr-90 (3M Co. Spec.). No special laboratory facilities, remote handling equipment, or additional storage containers or shielding are required.

14) Radiation Protection Program

1. The irradiator will be used only by International Nutronics; i.e., an employee of International Nutronics will be physically present at any and all times that there is gas flow through the irradiator. This operation will be under the supervision of K. J. Bialy or J. D. Buchanan or A. Chin.

2. During periods when the irradiator is not attended by authorized employees of International Nutronics, it will be physically secured by lock to prevent unauthorized operation of the unit or unauthorized movement of the unit.

3. When the irradiator is in operation, i.e. when a stream of gas is passing through it, the radiation level of the effluent will be monitored using a radiation detector sensitive to Sr-90 beta and bremsstrahlung radiation. The radioactivity of the effluent stream will be monitored through a total wall and (or) window thickness (effluent line wall, or "window", plus detector window) of 800 mg $cm^{-2}$ or less ( a thickness estimated to transmit 1% or more of the Y-90 betas). The flow of gas through the irradiator will be stopped immediately should any significant increase in the radiation level of the effluent above background be detected.

4. The operating temperature and pressure limits, specified by 3M, are 1000°F max. and 1000 psi max. respectively. To provide an additional margin of safety, we will lower the limits for our operations to 800°F max. and 400 psi max.

5. No gas known to cause corrosion of type 316 stainless steel, which contains the sources within the irradiator, will knowingly be passed through the irradiator.

6. The gas stream which has passed through the irradiator will be exhausted through a high efficiency particulate air filter to provide efficient removal of Sr-90 particulates in the unlikely event of an accidental release of radioactivity from the irradiator.

7. The irradiator will be leak tested at least every six months by filling it with water, allowing the water to stand in contact with the irradiator for at least one hour, then measuring the radioactivity of the water by a method which will allow the detection of 0.005 μCi of Sr-90 in the water. This test will be performed by, or under the supervision of Mr. J. D. Buchanan, the radiation safety officer. (Under State of California Radioactive Material License #1822-59, International Nutronics is authorized to perform tests for leakage and/or contamination of sealed sources, as a customer service, provided that this service is performed by, or under the supervision of, Mr. Buchanan.)

15) Waste Disposal

No radioactive waste is expected to be produced.

State of California
Department of Public Health

Bureau of Radiological Health, 2151 Berkeley Way, Berkeley, California 94704

# STATEMENT OF TRAINING AND EXPERIENCE

Instruction: Every individual proposing to use radioactive material is required to submit a Statement of Training and Experience in duplicate to the address given above. Physicians should request Form RH 3000 when applying for medical isotope authorizations.

1. Name of proposed user: John D. Buchanan Position title: Radiation Safety Officer
   Address: 200 Third Street City: Los Altos, CA Zip: 94022

2. Description of proposed use
   Any present or future use of radioactive materials in accordance with the Radioactive Materials License(s) of International Nutronics, Inc.

3. Training
   a. High School Graduate: Yes X No ____
   b. College or University: Name and location University of Arizona, Tucson
      Years Completed 5 Degree B.S. Course of Study Chemistry; Math, Physics
   c. Education specifically applicable to use of radioactive material
      One month full-time course in fundamentals of nuclear science, radiation protection, and nuclear chemistry at Tracerlab, Inc., Berkeley, CA, in 1950.
      Continuous on-the-job training and self study over a 20 year period of employment in the nuclear industry. Competence in radiation protection is attested to by certification by the American Board of Health Physics in 1970.

4. Experience
   a. List experience with radioactivity beginning with most recent
      (1) Dates: From Feb. '71 to present.
      Title and duties: Mgr. Applied Research and Radiation Safety Officer
      Employer: International Nutronics Address: 200 Third St. Los Altos, CA 94022
      (2) Dates: From Nov. 1962 to Feb. 1971.
      Title and duties: Scientist; Manager, Nuclear Products, Applications and Measurements. Chairman, Radiation Safety Committee
      Employer: Teledyne-Isotopes Address: 4062 Fabian St., Palo Alto, CA
      (3) Dates: From Aug. 1959 to Nov. 1962.
      Title and duties: Staff Associate - Performed research in reactor chemistry and neutron activation analysis using a TRIGA reactor.
      Employer: General Atomic Address: San Diego, CA
      (4) See attachment

b. Radioactive materials previously used. Cite typical radioisotopes in appropriate box and key to Part 4.a above.

| | Quantities Handled | | | |
|---|---|---|---|---|
| | Microcuries | Millicuries | Curies | Kilocuries |
| Sealed sources | | Ra-226 (2) | Sr-90 (1)<br>Cs-137 (2) | Co-60 (1) |
| Unsealed alpha emitters | | Am-241<br>Pu-239 (2) | | |
| Unsealed beta-gamma emitters | | I-125, Cs-137<br>Ba-131 (2) | | |
| Neutron sources | | | | |

c. Describe procedures similar to those proposed in Part 2 with which you have had experience. Indicate months or years for each and key to Part 4.a above.

See Attachment

d. Indicate which types of facilities you have used and key to Part 4.a.

(X) Ordinary chemical laboratories (2,3,4)

(X) "Controlled Area" (Type B) laboratories (2,3,4)

(X) Glove boxes (2)

(X) Shielded glove boxes (2)

( ) Caves with remote manipulators

(X) Field operations with portable equipment (4)

5. License reference

This document is submitted with reference to:

( ) An existing license (No. _____) in the name _____

(X) A new USAEC license application in the name International Nutronics, Inc.

6. Certificate

I hereby certify that all information contained in this Statement is true and correct.

John K Buchanan
Signature

June 16, 1971
Date

22766

Attachments - John D. Buchanan

4.a. (4) Dates: From July 1950 to Aug. 1959.

Title and duties: Jr. Chemist to Sr. Chemist; Section Head: Peformed and supervised radiochemical analysis.

Employer: Tracerlab, Inc. Address: Richmond, CA

4.C

(1) Manager of Applied Research (4 mo) and Radiation Safety Officer (2 mo). Prepared application for license for use of 5 mg of Cf-252 which resulted in current California radioactive materials license for this purpose. Performed safety review of facilities, equipment, and procedures for handling 30,000 Ci of Co-60 in a multipurpose irradiation facility. Obtained license and performed initial checkout for use of a 50 Ci Model 3M1B Sr-90 Irradiator.

(2) Acted as chairman of the Radiation Safety Committee and supervised health physics operations for the Laboratory (4 yrs). This work included use of both sealed and unsealed sources, radiation surveys, calibration of radiation survey instruments, hazards evaluations, facilities design, radioassay, and radiobioassay. Developed and produced radioactive sources and a beta irradiator (4 yrs). Developed radiotracer applications (4 yrs). Developed nuclear radiation detection methods (8 yrs). Developed methods and techniques of radiochemical analysis for environmental and biological samples (4 yrs). Developed radiochemical processing methods for radioisotope production and a decontamination process (2 yrs). Consulted on thermoluminescence dosimetry in medical and health physics applications (6 mo).

(3) Performed research on the behavior of volatile fission products in high temperature gas-cooled reactors (1 yr). Performed and supervised research and development on neutron activation analysis using a 250-KW TRIGA reactor (2 yrs).

(4) Performed and supervised high-precision radiochemical analysis for numerous radionuclides in nuclear weapon's debris and other complex mixtures of fission products and neutron activation products (9 yrs). Developed radiochemical procedures for many elements (6 yrs). Performed extensive work on radiation detection and measurement techniques for the resolution of radioisotopic mixtures and for the determination of absolute disintegration rates (6 yrs). Conducted training courses in radioisotope applications and radiation safety (3 mo). Took part in field use of a radioactive gaseous tracer in a natural gas storage reservoir (1 mo).

State of California
Department of Public Health

Bureau of Radiological Health, 2151 Berkeley Way, Berkeley, California 94704

# STATEMENT OF TRAINING AND EXPERIENCE

Instruction: Every individual proposing to use radioactive material is required to submit a Statement of Training and Experience in duplicate to the address given above. Physicians should request Form RH 3000 when applying for medical isotope authorizations.

1. Name of proposed user: Karol J. Bialy Position title: Sr. Vice President

   Address: 200 Third Street City: Los Altos Zip: 94022

2. Description of proposed use

   Any present or future use of radioactive materials in accordance with the radioactive materials license(s) of International Nutronics, Inc.

3. Training

   a. High School Graduate: Yes X No _____ Worchester, MA.; Capitol Inst., Wash. DC., Florida Inst. Tech. Melbourne, FLa.

   b. College or University: Name and location Boston Univ., Boston, MA; Clark Univ., (see Above)

      Years Completed 4 Degree A.A.S.& B.S. Course of Study Physics

   c. Education specifically applicable to use of radioactive material
      Nuclear and atomic physics - 4 lecture courses and 2 laboratory courses.
      Physical chemistry - 2 lecture courses.
      Experimental research (Thesis) - designed laboratory facility, initiated its operation, and established operational procedures for a subcritical reactor university laboratory course and coordinated effort for initiating operation of a 5 MEV linear accelerator.

4. Experience

   a. List experience with radioactivity beginning with most recent

      (1) Dates: From Feb. 1969 to Present.

      Title and duties: Senior V.P.; Radiation Safety Officer Feb. '69 to Apr.'71 - Designed, supervised construction, tested & operated both a sewage irradiator & a radiation facility used for commercial product sterilization & other radiation effects

      Employer: International Nutronics Address: 200 Third St., Los Altos, CA

      (2) Dates: From Feb 1967 to Aug 1968.

      Title and duties: Director of Research and Engineering - designed & tested sewage irradiator unit (Co 60); assisted in Licensing for transp., receipt & use of 600 curie

      Employer: Energy Systems, Inc. Address: 150 Wickham Rd., Melbourne, Florida

      (3) Dates: From July 1964 to Oct. 1968.

      Title and duties: Senior Systems Test Engineer - provided launch base operations and safety requirements for Sr 90 RTG; Proposal Leader for ALSEP-SNAP RTG safety plan.

      Employer: Lockheed Missiles & Space Co. Address: Cape Kennedy, Florida

      (4) See Attachment

b. Radioactive materials previously used. Cite typical radioisotopes in appropriate box and key to Part 4.a above.

| | Quantities Handled | | | |
|---|---|---|---|---|
| | Microcuries | Millicuries | Curies | Kilocuries |
| Sealed sources | | Kr-85 5mc | Co 60-600 Curies 4.a. (2) | Pu 238 - 3K Curies 4. a. (4) |
| Unsealed alpha emitters | | | | Co 60 40 KCi 4.a. (1) |
| Unsealed beta-gamma emitters | | | | |
| Neutron sources | | Pu Be-450 Milli curies 3.c. | | |

c. Describe procedures similar to those proposed in Part 2 with which you have had experience. Indicate months or years for each and key to Part 4.a above.

(1) Design and handling safety considerations for water and sewage irradiation with Co 60 - 18 months - 4.a. (2)

(2) Instrumentation selection and utilization definition for survey, monitoring, and recording - 11 years 4.a. (1); 4.a. (2); 4.a. (3); 3C.

(3) System compatibility investigation; identifying safety limits, writing procedures and reports, directing personnel to incorporate and comply with these 4.a. (1); 4.a. (2); 4.a. (3); 4.a. (4); 3C: 5 years.

d. Indicate which types of facilities you have used and key to Part 4.a.

(X) Ordinary chemical laboratories

(X) "Controlled Area" (Type B) laboratories

( ) Glove boxes

( ) Shielded glove boxes

( ) Caves with remote manipulators

(X) Field operations with portable equipment

5. License reference

This document is submitted with reference to:

( ) An existing license (No. _____) in the name _____

(X) A new USAEC license application in the name International Nutronics, Inc.

6. Certificate

I hereby certify that all information contained in this Statement is true and correct.

Karl J Bidy
Signature

June 16, 1971
Date

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Attachment - K. J. Bialy

4. a.

(4) Dates: From Oct. 1956 to July 1964.

Title and duties: Engineering Staff Associate - environmental testing. instrumentation design, and launch base handling safety for SNAP-9A RTG.

Employer: Johns Hopkins University Address: 8621 Georgia Ave., Silver Springs, MD
Applied Physics Laboratory

State of California
Department of Public Health

Bureau of Radiological Health, 2151 Berkeley Way, Berkeley, California 94704

# STATEMENT OF TRAINING AND EXPERIENCE

Instruction: Every individual proposing to use radioactive material is required to submit a Statement of Training and Experience in duplicate to the address given above. Physicians should request Form RH 3000 when applying for medical isotope authorizations.

1. Name of proposed user: Allan Chin Position title: V.P. Eng'g/Mktg.
   Address: 200 Third St. City: Los Altos Zip: 94022

2. Description of proposed use

   Any present or future use of radioactive materials in accordance with the Radioactive Materials License of INI.

3. Training
   a. High School Graduate: Yes X No ____
   b. College or University: Name and location M.I.T. Cambridge, MA
      Years Completed 5 Degree M.S. Course of Study Ch.E.
   c. Education specifically applicable to use of radioactive material
      1. Graduate studies in Nuclear Eng'g.
      2. G. E. Co. Advanced Studies Program
      3. Self study intermittently for 10 years & continuous self study for 6 years.

4. Experience
   a. List experience with radioactivity beginning with most recent
      (1) Dates: From Sept. '69 to Present.
      Title and duties: V. P. Eng'g/Mktg - Responsible for the operation of a 30,000 Ci Co-60 Gamma Facility and 10,000 Ci Co-60 sewage treatment pilot plant.
      Employer: International Nutronics Address: 200 Third St., Los Altos, CA 94022
      (2) Dates: From 6-68 to 9-69.
      Title and duties: Mgr. Quality Engineering - Controlled and operated Beta ray back scatter thickness gages.
      Employer: Philco-Ford Address: Fabian Way, Palo Alto, CA
      (3) Dates: From 1-66 to 6-68.
      Title and duties: Supervisor Product Development-Controlled & operated X-ray machine - Experimental runs on 1 & 2 MEV electron beams.
      Employer: Raychem Address: 300 Constitution Dr., Menlo Park, CA

b. Radioactive materials previously used. Cite typical radioisotopes in appropriate box and key to Part 4.a above.

| | Quantities Handled | | | |
|---|---|---|---|---|
| | Microcuries | Millicuries | Curies | Kilocuries |
| Sealed sources | | INI 5 ($^{85}Kr$) | | INI 30 ($^{60}Co$) |
| Unsealed alpha emitters | | | | |
| Unsealed beta-gamma emitters | | | | |
| Neutron sources | | | | |

c. Describe procedures similar to those proposed in Part 2 with which you have had experience. Indicate months or years for each and key to Part 4.a above.

1. Performed material effects studies at G.E. 20,000-Ci Gamma Facility in Vallicitos over a 4 month period for INI.
2. Participated in two loading (2000 Ci and 10,000 Ci) of $^{60}Co$ in INI Sewage Treatment Pilot unit at Menlo Park. Utilized source for studying material effects on various materials over a two year period.
3. Frequent handling of 30,000 Ci of $^{60}Co$ at INI Gamma Facility as per present INI license, over a nine month period.

d. Indicate which types of facilities you have used and key to Part 4.a.

( ) Ordinary chemical laboratories

( ) "Controlled Area" (Type B) laboratories

( ) Glove boxes

( ) Shielded glove boxes

( ) Caves with remote manipulators

( ) Field operations with portable equipment

5. License reference

This document is submitted with reference to:

( ) An existing license (No. _____) in the name _____

(X) A new USAEC license application in the name International Nutronics, Inc.

6. Certificate

I hereby certify that all information contained in this Statement is true and correct.

Allan Chin
Signature

June 16, 1971
Date

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