

37-1048-1

Form AEC-313  
(9-55)ATOMIC ENERGY COMMISSION  
APPLICATION FOR BYPRODUCT MATERIAL LICENSEForm approved  
Budget Bureau No. 38-R027.3.

INSTRUCTIONS: Complete Items 1 through 19 if this is a new application. If renewal is requested, complete only Items 1 through 11 provided that with respect to the other items there has been no change in the information previously submitted. Mail two copies to: U. S. Atomic Energy Commission, P. O. Box E, Oak Ridge, Tennessee, Attention: Isotopes Extension, Division of Civilian Application. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. General requirements for issuance of an AEC Byproduct Material License are contained in Title 10, Code of Federal Regulations, Part 30.

|                                                                                                                                                                                                                                                                                                                |                                                      |                                                                                                  |  |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------------------------------------|--|
| 1. (a) NAME AND SHIPPING ADDRESS OF APPLICANT<br>(Institution, firm, hospital, person, etc.)                                                                                                                                                                                                                   |                                                      | (b) ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED<br>(If different from shipping address) |  |
| The Atlantic Refining Company<br>2700 Passyunk Ave., Philadelphia, Pa.                                                                                                                                                                                                                                         |                                                      |                                                                                                  |  |
| 2. DEPARTMENT TO USE BYPRODUCT MATERIAL<br>Research and Development Department                                                                                                                                                                                                                                 |                                                      |                                                                                                  |  |
| 3. INDIVIDUAL USER (Name and title of individual(s) who will use or directly supervise use of byproduct material)<br>F. W. Malpolder, Section Head, Analytical Division                                                                                                                                        |                                                      |                                                                                                  |  |
| 4. RADIOLOGICAL SAFETY OFFICER (Name of person qualified in radiological safety, if other than individual user)                                                                                                                                                                                                |                                                      |                                                                                                  |  |
| 5. PREVIOUS LICENSE OR AUTHORIZATION NUMBER (If this is an application for renewal of a license for approval of material obtained under a prior license or authorization for radioisotope procurement)<br>Not directly applicable. The work is similar to that approved in Authorizations Nos. 21457 and 8898. |                                                      |                                                                                                  |  |
| BYPRODUCT MATERIAL OR IRRADIATION SERVICE DESIRED                                                                                                                                                                                                                                                              |                                                      |                                                                                                  |  |
| 6. BYPRODUCT MATERIAL (Element and mass number)                                                                                                                                                                                                                                                                | 7. CHEMICAL AND/OR PHYSICAL FORM (Or catalog number) | 8. MAXIMUM AMOUNT OF RADIOACTIVITY IN MILLICURIES THAT YOU WILL POSSESS AT ANY ONE TIME          |  |
| Sulfur - 35                                                                                                                                                                                                                                                                                                    | S-35-F-1                                             | 10 millicuries                                                                                   |  |
| 9. 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                                                                                                                  |                                                      |                                                                                                  |  |

## STATEMENT OF USE

10. (a) DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. (If material is for "human use" complete Supplement A in lieu of this item. If material is to be used in or manufactured as a "sealed source" complete Supplement B in addition to this item.)

An analytical study will be made of the separation of alkyl benzene sulfonate from water and sewage in the laboratory. The efficiency of the separation will be determined by isotope dilution using alkylbenzene sulfonate tagged with sulfur-35.

(b) DESCRIBE PROCEDURES WHICH WILL BE OBSERVED TO MINIMIZE HAZARD FROM HANDLING, STORAGE, AND DISPOSAL OF THE BYPRODUCT MATERIAL

Protective clothing, shielding, and remote handling equipment are used in all stages of the synthesis of alkylbenzene sulfonate and in the subsequent separation of detergent on charcoal. The material is desorbed and counted by approved techniques. The waste radioactivity is placed in a shielded can and periodically disposed as described in item 19.

## CERTIFICATE

11. 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 do solemnly swear (or affirm) that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

|                                                                                     |                                                   |
|-------------------------------------------------------------------------------------|---------------------------------------------------|
| State of <u>Pennsylvania</u>                                                        | Applicant named in Item 1 <u>F. W. Malpolder</u>  |
| County of <u>Philadelphia</u>                                                       | By <u>[Signature]</u>                             |
| Subscribed and sworn to before me this <u>17th</u> day of <u>August</u> <u>1956</u> | Title of Certifying Official <u>W. E. HUBBARD</u> |
| <u>Burt C. Platt</u><br>Notary Public                                               | Date <u>August 16, 1956</u>                       |
| <u>Comm. Expires 4/14/57</u>                                                        |                                                   |

## 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.

1894

(Continued on reverse side)

16-57204-6

8811130236 881110  
PDR FOIA  
GUILYAR88-461 PDR

ATOMIC ENERGY COMMISSION  
APPLICATION FOR BYPRODUCT MATERIAL LICENSE

INSTRUCTIONS: Complete Items 12 through 19 if this is a new application. This information may be omitted from subsequent applications provided there is no change in the information previously submitted, and reference is made in Item 5 to the application on which this information appears.

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

| 12. TYPE OF TRAINING                                                                                                              | WHERE TRAINED                          | DURATION OF TRAINING     | ON THE JOB<br>(Circle answer) | FORMAL COURSE<br>(Circle answer) |
|-----------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|--------------------------|-------------------------------|----------------------------------|
| 1. Principles and practices of radiological health safety. . . . .                                                                | Oak Ridge Institute of Nuclear Studies | Radioisotopes Techniques | Yes No                        | Yes No                           |
| 2. Radioactivity measurement standardization and monitoring techniques and instruments. . . . .                                   | "                                      | 4 weeks course           | Yes No                        | Yes No                           |
| 3. Mathematics and calculations basic to the use and measurement of radioactivity. . . . .                                        | "                                      | July, 1951               | Yes No                        | Yes No                           |
| 4. Biological effects of radiation. . . . .                                                                                       | and in Laboratory                      | and 5 years              | Yes No                        | Yes No                           |
| 5. Actual use of radioisotopes in the types and quantities for which application is being made, or equivalent experience. . . . . | of The Atlantic Refining Co.           | of industrial training   | Yes No                        | Yes No                           |

13. ISOTOPE HANDLING EXPERIENCE

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

14. If Radiological Safety Officer named in Item 4 is different from individual user named in Item 3, use supplementary sheet to provide equivalent information on "Training and Experience With Radioactivity of Radiological Safety Officer." Supplementary sheet is attached (Circle answer) Yes No

PHYSICAL FACILITIES, EQUIPMENT, AND RADIATION INSTRUMENTATION

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

| TYPE OF INSTRUMENTS<br>(Include make and model number of each) | NUMBER AVAILABLE | RADIATION DETECTED | SENSITIVITY RANGE<br>(mr/hr) | WINDOW THICKNESS<br>(mg/cm <sup>2</sup> ) | USE (Monitoring, storing, measuring) |
|----------------------------------------------------------------|------------------|--------------------|------------------------------|-------------------------------------------|--------------------------------------|
| See attached sheet                                             |                  |                    |                              |                                           |                                      |

16. FILM BADGES, DOSIMETERS, AND OTHER PERSONNEL MONITORING DEVICES INCLUDING PROCEDURES

Film badge service provided by TracorLab.  
Although we also have available pocket-sized ionizers, the exposures to radioactivity have been too low to require their use.

17. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE (For each instrument, state method of calibration and processing, or name supplier)

The instruments are calibrated at the beginning of each experimental program. Thereafter the instruments are checked at least once a month. Calibrated radiolead and cobalt-60 sources are used.

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

Equipment includes an enclosed laboratory room, large hood approved by A.E.C., lead storage container, iron brick shielding, remote handling tongs and pipette, work jackets, rubber gloves and masks, special glassware and supplies.

(b) SKETCHES OF SUCH FACILITIES ARE ATTACHED (Circle answer)

Yes ☒ No

19. DESCRIBE BRIEFLY RADIATION SURVEYING PROCEDURES AND METHODS OF DISPOSING OF RADIOACTIVE WASTES

The laboratory is checked with the survey meter daily. The radioactive waste is placed in a metal container, embedded in cement in a 50 gal. drum and then dropped into the sea beyond the Continental shelf. This method was approved by the A.E.C. in 1951.

## 13. Isotope Handling Experience

| Isotope                      | Max. Amount | Where experience was gained | Duration of Experience | Type of Use                                                          |
|------------------------------|-------------|-----------------------------|------------------------|----------------------------------------------------------------------|
| Sulfur - 35                  | 100 mc      | Atlantic Refining Co.       | 3 years                | Testing synthetic detergents                                         |
| Phosphorus - 32              | 40 mc       | " " "                       | 4 years                | Uptake of phosphorus by plants, migration of phosphorus through soil |
| Arsenic - 76                 | 33 mc       | " " "                       | 3 years                | Testing arsenate residue on fruits, also as a herbicide.             |
| Calcium - 45                 | 10 mc       | " " "                       | 2 years                | Used in clothes washing studies and asphalt testing.                 |
| Strontium - 90               | 20 mc       | " " "                       | 2 years                | Asphalt testing                                                      |
| Carbon - 14 tagged compounds | 2 mc        | " " "                       | 2 years                | Testing and synthesis of detergents                                  |

## 15. Radiation Detection Instruments

| Type of Instruments                                | Number Available | Radiation Detected | Sensitivity Range (mr/hr) | Window Thickness (mg/cm <sup>2</sup> ) | Use        |
|----------------------------------------------------|------------------|--------------------|---------------------------|----------------------------------------|------------|
| Tracerlab Survey Meter Model SU-5A                 | 1                | Beta-gamma         | .02-20                    | 30                                     | Monitoring |
| Nuclear Scaler Model 102 and Geiger tube detector  | 1                | Alpha-beta-gamma   |                           | 2                                      | Measuring  |
| General Electric Scintillation Counter No. 9747109 | 1                | Alpha-beta-gamma   |                           |                                        | Measuring  |
| Nuclear Low Counter Model DA6A                     | 1                | Alpha-beta-gamma   |                           |                                        | Measuring  |
| Victoreen pen-type ionization chambers             | 6                | Alpha-beta-gamma   | 200                       |                                        | Monitoring |
| Victoreen Minometer                                | 1                |                    |                           |                                        |            |

May 31, 1964

|                                                 |                                                         |                                        |                        |
|-------------------------------------------------|---------------------------------------------------------|----------------------------------------|------------------------|
| Date Rec. <u>MAY 1 1964</u>                     | Exp. Date                                               | Issue Date                             | Tech. Rev. <u>WJC</u>  |
| Control No. <u>18466</u>                        | Ref. No.                                                | License No. <u>37-1848-3</u><br>(E 64) | Amendment No. <u>3</u> |
| Isotope                                         | Form                                                    | Possession Limit                       |                        |
| A. Any b m between atomic nos. 3483, inclusive. | A. irradiated aromatic hydrocarbons containing aniline. | A. 1 mc.                               |                        |
| B.                                              | B.                                                      | E.                                     |                        |
| C.                                              | C.                                                      | C.                                     |                        |
| D.                                              | D.                                                      | D.                                     |                        |
| E.                                              | E.                                                      | E.                                     |                        |
| F.                                              | F.                                                      | F.                                     |                        |
| G.                                              | G.                                                      | G.                                     |                        |
| H.                                              | H.                                                      | H.                                     |                        |

Authorized Use

A. Laboratory research experiments in internal combustion engines

add condition to read as 13 of am #2

Hugh R. Jackson

|                                                                                            |  |                                                                                                                                            |  |
|--------------------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------------------------------------|--|
| SCHA Review Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>            |  | Exemptions<br>1. A B C 9. A B C<br>2. A B C 10.<br>3. A B C D 11.<br>4. A B 12.<br>5. 13.<br>6. 14. A B C<br>7. 15.<br>8. A B C 16. (over) |  |
| Type User (Circle One) 1 2 3 4 5 6 7 Other                                                 |  | Approve <input checked="" type="checkbox"/> Void <input type="checkbox"/>                                                                  |  |
| Mail To: <u>W. A. Myers</u> Date Mailed <u>MAY 15 1959</u>                                 |  | Tech. Rev. <u>WJC</u> Date <u>5-13-59</u>                                                                                                  |  |
| Remarks, letters, phone calls, visits, exemptions, etc.<br>(Use reverse side if necessary) |  | Chief <u>RES</u> Date <u>5-15-59</u>                                                                                                       |  |

A/11

|                                                                              |                                    |                       |                 |
|------------------------------------------------------------------------------|------------------------------------|-----------------------|-----------------|
| Date Rec. NOV 7 1958                                                         | Exp. Date                          | Issue Date            | Tech. Rev. A/B  |
| Control No. 14088                                                            | Ref. No.                           | License No. 37-1048-3 | Amendment No. L |
| Isotope                                                                      | Form                               | Possession Limit      |                 |
| A. In accordance with letters dated September 11, 1958 and October 23, 1958, | B. 37-1048-3 is amended as follows | B.                    |                 |
| C. Item 3: Add the symbol C-57 below the license number                      | C.                                 | C.                    |                 |
| D. Add the following condition                                               | D.                                 | D.                    |                 |
| E. Byproduct material may be disposed of by burial at sea according          | E.                                 | E.                    |                 |
| F. to the procedure described in letters dated September 11, 1958 and        | F.                                 | F.                    |                 |
| G. October 30, 1958                                                          | G.                                 | G.                    |                 |
| H.                                                                           | H.                                 | H.                    |                 |

Authorized Use

A.

APPROVED  
NOV 12 1958

|                                                                                            |  |                               |            |
|--------------------------------------------------------------------------------------------|--|-------------------------------|------------|
| SCHA Review Yes <input type="checkbox"/> No <input type="checkbox"/>                       |  | Conditions                    |            |
| Type User (Circle One) 1 2 3 4 5 6 7 Other                                                 |  | 1. A B C                      | 9. A B C   |
| Mail To: Myers                                                                             |  | 2. A B C                      | 10.        |
| Date Mailed NOV 1 1958                                                                     |  | 3. A B C D                    | 11.        |
| Remarks, letters, phone calls, visits, exemptions, etc.<br>(Use reverse side if necessary) |  | 4. A B                        | 12.        |
|                                                                                            |  | 5.                            | 13.        |
|                                                                                            |  | 6.                            | 14. A B C  |
|                                                                                            |  | 7.                            | 15.        |
|                                                                                            |  | 8. A B C                      | 16. (over) |
| Approve <input checked="" type="checkbox"/>                                                |  | Void <input type="checkbox"/> |            |
| Tech. Rev. AB                                                                              |  | Date 11-10-58                 |            |
| Chief CRA                                                                                  |  | Date 11/13/58                 |            |

|                                   |             |                  |                                        |                                      |
|-----------------------------------|-------------|------------------|----------------------------------------|--------------------------------------|
| Date Rec.<br>Control<br>No. 10205 | APR 19 1958 | Exp. : e         | Issue Date<br>License<br>No. 37-1048-3 | Tech. Rev. <i>Wm</i><br>Amend. No. 1 |
| Isotope                           | Form        | Possession Limit |                                        |                                      |
| A.                                | A.          | A.               |                                        |                                      |
| B.                                | B.          | B.               |                                        |                                      |
| C.                                | C.          | C.               |                                        |                                      |
| D.                                | D.          | D.               |                                        |                                      |
| E.                                | E.          | E.               |                                        |                                      |
| F.                                | F.          | F.               |                                        |                                      |
| G.                                | G.          | G.               |                                        |                                      |
| H.                                | H.          | H.               |                                        |                                      |

A. Authorized Use

Cond # 11 is amended to read: subst. H.R. Jackson in Miller

|                                                                                            |                               |            |
|--------------------------------------------------------------------------------------------|-------------------------------|------------|
| SCHA Review Yes <input type="checkbox"/> No <input type="checkbox"/>                       | Conditions                    |            |
| Type User (Circle One) 1 2 <u>3</u> 4 5 6 7 Other                                          | 1. A B C                      | 9. A B C   |
| Mail to Mr. H. R. Jackson                                                                  | 2. A B C                      | 10.        |
| MAY 23 1958                                                                                | 3. A B C                      | 11.        |
| Remarks, letters, phone calls, visits, exemptions, etc.<br>(Use reverse side if necessary) | 4.                            | 12.        |
|                                                                                            | 5.                            | 13.        |
|                                                                                            | 6.                            | 14. A B C  |
|                                                                                            | 7.                            | 15.        |
|                                                                                            | 8. A B C                      | 16. (over) |
| Approve <input checked="" type="checkbox"/>                                                | Void <input type="checkbox"/> |            |
| Tech. Rev. <i>Wm</i>                                                                       | Date 5/20/58                  |            |
| Chief <i>JW</i>                                                                            | Date 5/22/58                  |            |

|                         |                           |                      |                            |                  |                             |               |
|-------------------------|---------------------------|----------------------|----------------------------|------------------|-----------------------------|---------------|
| CONTRACT NUMBER<br>5388 | DATE RECEIVED<br>MAY 1957 | TECH. REVIEWER<br>WV | EXPIRATION DATE<br>5/21/59 | REFERENCE NUMBER | LICENSE NUMBER<br>37-1048-3 | AMENDMENT NO. |
|-------------------------|---------------------------|----------------------|----------------------------|------------------|-----------------------------|---------------|

|                                                                                 |                                                                                  |                                 |                                                                                       |
|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------|
| ISOTOPE<br><i>255 Bismuth<br/>radioactive<br/>atomic number<br/>83<br/>beta</i> | FORM<br><i>I radiates polybutene<br/>lubricating oil<br/>containing aniline.</i> | POSSESSION LIMIT<br><i>1 mc</i> | USE<br><i>Laboratory<br/>Research experiments in<br/>internal combustion engines.</i> |
|---------------------------------------------------------------------------------|----------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------|

*Noted by KEY  
5/19/58 R E B*

|                  |    |             |     |    |                                                                                                                    |            |         |                |                |
|------------------|----|-------------|-----|----|--------------------------------------------------------------------------------------------------------------------|------------|---------|----------------|----------------|
| INSTRUMENTATION  | OK | SCHA REVIEW | yes | no | LETTERS-PHONE CALLS-VISITS<br><i>not - for C-14 but<br/>condition on <del>the</del> the<br/>to see see Bill #4</i> | CONDITIONS |         | APPROVE        | CANCEL         |
| INSPECT. REPORT  | ✓  | Quimby      | yes | no |                                                                                                                    | 1. A B C   | 9.      | REVIEWER       | DATE           |
| USERS EXPERIENCE | OK | Brown       | yes | no |                                                                                                                    | 2. A B C   | 10. A B | <i>W J A</i>   | <i>5/16/57</i> |
| 313a             | ✓  | Childs      | yes | no |                                                                                                                    | 3.         | 11.     | CHIEF          | DATE           |
| S. S. CATALOGUE  | ✓  | Cooper      | yes | no |                                                                                                                    | 4. A B     | 12.     | <i>PCA/82B</i> | <i>5-17-57</i> |
|                  |    |             |     |    | 5. A B C                                                                                                           | 13. A B    |         |                |                |
|                  |    |             |     |    | 6.                                                                                                                 | 14.        |         |                |                |
|                  |    |             |     |    | 7. A B C                                                                                                           | 15. A B C  |         |                |                |
|                  |    |             |     |    | 8. A B                                                                                                             | 16. A B    |         |                |                |

APPENDIX C (ITEM 1)

Radiological Safety Branch  
Isotopes Extension  
Division of Civilian  
Application

(Draft 3/5/56)

FIELD REPORT DETAILED OUTLINE  
(determine all pertinent details)

Introduction

Name and Address of Institution  
Department  
Name and Title of User Visited  
Description of License  
Field Representative  
Type and Date of Visit  
Local Agent Making Joint Visit

I. Administrative Control

A. Program

B. Organization

1. Designation of Responsibility

- (a) RSO - qualifications
- (b) Isotopes Committee
  - (1) members
  - (2) chairman
  - (3) functions

C. Written Administrative (Radiological Protection) procedures (instructions)

1. Details covered

- (a) responsibility for material
- (b) responsibility for decisions concerning radiation protection

2. Responsible person for changes therein

3. Instruction of personnel

- (a) area designations (labels, radiation levels, rules, roping off, etc.)
- (b) handling of material
  - (1) techniques
  - (2) security
  - (3) storage
  - (4) disposal
  - (5) leak testing
- (c) monitoring procedures

D. Experience and Training of Personnel

1. Choice of personnel

- (a) education
- (b) experience

2. Training program

- (a) details covered
- (b) frequency and length

E. Procurement Control

1. Responsibility

2. System

3. Method of maintaining possession limit

## II. Material Licensed

### A. Material on Hand

1. Types
2. Quantities
3. Forms
  - (a) Sealed sources
    - (1) capsule
      - (a) model
      - (b) identification
      - (c) tag
    - (2) Leak test
  - (b) Other

### B. Calibration Procedures

1. Instrumentation
2. Method

### C. Uses

1. Human
  - (a) Research
  - (b) Routine
    - (1) Diagnostic
    - (2) Therapeutic
2. Non-Human
  - (a) Research
  - (b) Routine
  - (c) Field

### D. Disposal

1. Method of disposal
  - (a) site
  - (b) control
2. Quantity
  - (a) amount of effluent
  - (b) concentration
  - (c) accumulation

## III. Facilities and Equipment

### A. Laboratory or Radiation Room

1. Location
  - (a) Surrounding areas
  - (b) control
    - (1) Interlocks
    - (2) Barriers
    - (3) Marked or roped off areas
    - (4) Segregation

2. Ventilation

- (a) General Air Flow
- (b) Hoods and Dry Boxes
  - (1) Air Flow
    - (a) measure (75 to 100 lfm)
    - (b) design (turbulence)
  - (2) Exhaust
    - (a) location of blower
    - (b) filters
    - (c) length and location of stack
    - (d) concentrations released
  - (3) Surfaces
  - (4) Shielding
  - (5) Location of control

3. Surfaces

- (a) floor
- (b) walls
- (c) ceiling
- (d) sink
  - (1) drain
  - (2) segregation
- (e) bench tops
- (f) secondary contamination control
  - (1) trays
  - (2) diaper paper

B. Shielding

1. Portable and semi-portable

- (a) security
- (b) design
  - (1) material
  - (2) thickness
  - (3)
- (c) fire resistance
- (d) radiation levels
- (e) labels

2. Fixed

(see above)

C. Equipment

- 1. remote pipettes
- 2. tongs
- 3. syringes
- 4. effusion apparatus
- 5. waste containers
  - (a) Labels
  - (b) Contamination control

D. Instrumentation

1. Measurement
  - (a) Uptake
  - (b) Assay
2. Survey
  - (a) low level
  - (b) high level
  - (c) calibration
  - (d) operation
  - (e) air and water sampling
3. Personnel Monitoring
  - (a) Film Badge
    - (1) supplier
    - (2) readings
  - (b) Dosimeters or chambers
    - (1) operation
    - (2) readings
4. Leak Test
  - (a) Method
  - (b) Handling facilities
  - (c) Counter

IV. Precautionary Procedures

A. Personnel Monitoring

1. Physical Examinations
  - (a) pre-employment
    - (1) blood count
    - (2) general
  - (b) Routine
    - (1) blood count
    - (2) general

2. Bioassay

- (a) Urine
- (b) Fecal
- (c) Other

3. Overexposures

- (a) Magnitude
- (b) Corrective action

B. Radiological Survey Procedures

1. Air
2. Surface and personnel
3. Area
4. Effluent
5. Leak test

- C. Controlled Areas
  - 1. Radiation Levels
    - (a) High radiation area
      - (1) Control alarm
      - (2) Temporary
    - (b) Radiation Area
    - (c) Airborne radioactivity
    - (d) Containers
    - (e) Disposal Area
  - 2. Caution Signs, signals, labels
- D. Uncontrolled Areas
  - 1. Radiation Levels
    - (a) Peak
    - (b) Integrated
  - 2. Signs, signals, labels
  - 3. Occupancy

- V. Records
  - A. Personnel monitoring
  - B. Surveys
    - 1. Area
    - 2. Leak tests
  - C. Receipt and transfer
  - D. Disposal
  - E. Accidents, over-exposure
    - 1. Commission notified

- VI. Compliance with Regulations
  - A. Possession limit
  - B. Location of Material
  - C. Use
  - D. Instruction of personnel
  - E. Exposure of personnel
  - F. Export

- VII. Compliance with Conditions of License
  - A. Information on applications
    - 1. Instrumentation
    - 2. Facilities
    - 3. Equipment
    - 4. Procedures
  - B. Special Conditions
    - 1. Radiation surveys
    - 2. Written procedures
    - 3. Detailed drawings
    - 4. Tags

- 3. Controlled Areas
  - 1. Radiation Levels
    - (a) High radiation area
      - (1) Control alarm
      - (2) Temporary
    - (b) Radiation Area
    - (c) Airborne radioactivity
    - (d) Containers
    - (e) Disposal Area
  - 2. Caution Signs, signals, labels
- D. Uncontrolled Areas
  - 1. Radiation Levels
    - (a) Peak
    - (b) Integrated
  - 2. Signs, signals, labels
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- V. Records
  - A. Personnel monitoring
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    - 1. Area
    - 2. Leak tests
  - C. Receipt and transfer
  - D. Disposal
  - E. Accidents, over-exposure
    - 1. Commission notified

- VI. Compliance with Regulations
  - A. Possession limit
  - B. Location of Material
  - C. Use
  - D. Instruction of personnel
  - E. Exposure of personnel
  - F. Export

- VII. Compliance with Conditions of License
  - A. Information on applications
    - 1. Instrumentation
    - 2. Facilities
    - 3. Equipment
    - 4. Procedures
  - B. Special Conditions
    - 1. Radiation surveys
    - 2. Written procedures
    - 3. Detailed drawings
    - 4. Tags

VIII. Hazardous Conditions

A. Radiation Levels

B. Corrective Measures

1. Recall or reclaim material
2. Responsibility for maintaining corrected conditions.