NRC FORM 313
(7-89)
10 CFR 30, 32, 33, 34, 35 and 40

APPLICATION FOR MATERIAL LICENSE

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED BY OMB
3150-0120
Expires 5-31-87

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATIONS FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF FUEL CYCLE AND MATERIAL SAFETY, NMSS
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS, IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION I
NUCLEAR MATERIALS SAFETY SECTION B
631 PARK AVENUE
KING OF PRUSSIA, PA 19406

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION II
NUCEAR MATERIALS SAFETY SECTION
101 MARIETTA STREET, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION III
MATERIALS LICENSING SECTION
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
MATERIAL RADIATION PROTECTION SECTION
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TX 76011

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON, AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION V
NUCLEAR MATERIALS SAFETY SECTION
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CA 94596

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTION.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- [ ] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER _____
- [X] C. RENEWAL OF LICENSE NUMBER 07-00455-38

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include Zip Code)*

E. I. Dupont de Nemours & Co., Inc.
Medical Products Department
Glasgow Site
Wilmington, DE 19898

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

E. I. Dupont de Nemours & Co., Inc.
Glasgow Site
Route 896
Glasgow, DE 19702

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Andrew T. Berta

TELEPHONE NUMBER: (302) 451-9459

SUBMIT ITEMS 5 THROUGH 11 ON 8½ x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time: See attached copy of Current License, Amendment 04

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED: R&D as defined in 10CFR Part 30, par. 30.4(g)

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE: On file - 3 new members attached

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS: Included in item 10

9. FACILITIES AND EQUIPMENT: On file per license. See attached to include Buildings 500 & 800

10. RADIATION SAFETY PROGRAM: Copy of Glasgow Site Radiation Safety Manual enclosed

11. WASTE MANAGEMENT: Included in item 10

12. LICENSEE FEES *(See 10 CFR 170 and Section 170.31)*
FEE CATEGORY: 3L
AMOUNT ENCLOSED: $ 700.00

13. CERTIFICATION. *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, AND 40 AND THAT ALL INFORMATION CONTAINED HEREIN, IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

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.

SIGNATURE–CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
Andrew T. Berta	ANDREW T. BERTA	GLASGOW SITE RADIATION SAFETY OFFICER	11/11/1987

14. VOLUNTARY ECONOMIC DATA

a. ANNUAL RECEIPTS
- [ ] <$250K
- [ ] $250K–500K
- [ ] $500K–750K
- [ ] $750K–1M
- [ ] $1M–3.5M
- [ ] $3.5M–7M
- [ ] $7M–10M
- [ ] >$10M

b. NUMBER OF EMPLOYEES *(Total for entire facility excluding outside contractors)*

c. NUMBER OF BEDS

d. WOULD YOU BE WILLING TO FURNISH COST INFORMATION *(dollar and/or staff hours)* ON THE ECONOMIC IMPACT OF CURRENT NRC REGULATIONS OR ANY FUTURE PROPOSED NRC REGULATIONS THAT MAY AFFECT YOU? *(NRC regulations permit it to protect confidential commercial or financial—proprietary—information furnished to the agency in confidence)*
- [ ] YES
- [ ] NO

16 NOV 1987

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS	APPROVED BY
REN	Dec. 2 I	3L	9002090369 B90530 REG1 LIC30 07-00455-38 PDR 108045	S. Kimberly
AMOUNT RECEIVED	CHECK NUMBER			DATE
$700	273-22149			12/1/87

R.P.O. Form #1, side 1

OCCUPATIONAL TRAINING AND EXPERIENCE
STATEMENT OF TRAINING AND AGREEMENT

(Must be Completed Before Approval to use Radioactive Materials can be Granted)

1. NAME Stephen T Toy SS# 179-30-8696 D.O.B. 10/01/[illegible]
2. DEPT. Medical Products BLDG. 300 ROOM # 150
3. SUPERVISOR R. Burns EXT 9216
4. Previous Employment(s) Involving: Radiation Exposure (Include this information on back of this sheet)
   1. Name and Address of Business — U of Fl; U of Tx; Case Western Res; Thos Jefferson; DuPont; DuPont CONTRACT
   2. Dates of Employment — 1961–1966; 1966; 1966–1973; 1973–date
   3. Periods of Exposure — intermittent
   4. Whole Body Exposure, REM
   5. Method of Monitoring your Exposure: film & ring badges, urine samples, thyroid scans.

5.

TYPE AND DATE OF TRAINING	WHERE TRAINED ON JOB/FORMAL	DURATION OF TRAINING
1) Principle and Practices of Radiation Protection	① U of Florida Dept of Biochemistry ② E.I. du Pont	2 graduate Semesters continuous and informa
2) Radioactivity measurement, monitoring techniques and instruments	Same as above	
3) Mathematic Basics to Use and Measurement of Radioactivity	Same as above	
4) Biological Effect of Radiation	In addition to above, I took a 2 week course on Biohazards and Safety offered by Johns Hopkins University in which (4) was covered.	

6. Actual Isotopes Used

ISOTOPES	MAXIMUM AMOUNT USED AT ONE TIME	DURATION AND TYPE OF USE
1) ^{3}H 6) ^{125}I	no more than 5mCi was ever used at one time, generally, 100–300μCi quantities were used	All six isotopes were used at various times in the course of research studies done over the past 27 years.
2) ^{14}C		
3) ^{32}P		
4) ^{51}Cr		
5) ^{35}S		

7. I certify the answers to this questionnaire are true and accurate to the best of my knowledge and belief as of September 15, 1987 (Date)

Stephen T. Toy (Signature)

8. APPROVALS: R Burns (Supervisor)

R. A. Yates Rev. 12/30/85

TRAINING AND EXPEPIENCE OF EACH INDIVIDUAL NAMES IN ITEM 4

NAME

TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a) Principles and Practices of Radiation Protection	① U of Fla Dept of Biochemistry ② E.I. du Pont	① one-half year (2 semesters) ② continuous	✓	✓
b) Radioactivity measurement standardization and monitoring techniques and instruments	Same as above	Same	Same	Same
c) Mathematics and Calculations basic to the use and measurements of radioactivity	Same as above	Same	Same	Same
d) Biological Effects of Radiation. Experience with Radiation	③ In addition to above, added: Johns Hopkins University	①+② Same ③ 2 weeks	①+② Same	①+② Same ③ ✓

Isotope	Maximum Amt. *	Where Experience Was Gained	Duration of Experience	Type of Use
^{3}H	1 mCi	U of FL; U of TX; Du Pont	20 years	Research - labelling nucleic acids + prot
^{14}C	1 mCi	U of FL; Case Western, Du Pont	20 years	protein labelling + prostaglandins
^{32}P	5 mCi	U of FL; U of TX; Du Pont	10 years	labelling nucleic acids, viruses
^{35}S	1 mCi	U of Fl	1 year	labelling proteins
^{51}Cr	5 mCi	Case Western, Jefferson Med School + Du Pont	10 years	labelling cell membranes
^{125}I	1 mCi	Du Pont	1 year	labelling proteins

R. A. Yates

Rev. 12/30/85

* refers to maximum amount ever used on single occasion.

(Must be Completed Before Approval to use Radioactive Materials can be Granted)

Baby #43

OCCUPATIONAL TRAINING AND EXPERIENCE
STATEMENT OF TRAINING AND AGREEMENT

1. NAME Robin Resch Charlton SS # 068-46-7937 D.O.B. 7/13/52
2. DEPT. Biomedical Products BLDG. Glasgow Research Lab ROOM # 3E20
3. SUPERVISOR John A. Wekrly
4. Previous Employment(s) Involving: Radiation Exposure
(Include this information on back of this sheet) 4 sites, Ⓐ-Ⓓ, listed on back of sheet
   1. Name and Address of Business
   2. Dates of Employment
   3. Periods of Exposure
   4. Whole Body Exposure, REM
   5. Method of Monitoring your Exposure

5.

TYPE AND DATE OF TRAINING	WHERE TRAINED ON JOB/FORMAL	DURATION OF TRAINING
1) Principle and Practices of Radiation Protection	sites Ⓐ-Ⓓ gave me on-the-job training from experienced users and radiation safety personnel in these subject areas. Formal course required at Yale University, also read on my own.	on-the-job: 9½ yr. formal: ½ day
2) Radioactivity measurement, monitoring techniques and instruments		
3) Mathematic Basics to Use and Measurement of Radioactivity		
4) Biological Effect of Radiation		

6. Actual Isotopes Used

ISOTOPES	MAXIMUM AMOUNT USED AT ONE TIME	DURATION AND TYPE OF USE
1) ^{45}Ca	10 μCi	5 years, tracer for ion transplat studies
2) ^{125}I	250 μCi	3 years, ~~RIA kits only~~ receptor binding studies with ^{125}I-labeled compounds, RIA kits
3) ^{131}I	2 mCi	1 month, cell surface protein iodination and purification
4) ^{3}H	20 μCi	4½ years, receptor binding and ion transport studies

more on back of sheet

7. I certify the answers to this questionnaire are true and accurate to the best of my knowledge and belief as of 2/7/84 (Date)

Robin Resch Charlton (Signature)

8.) APPROVALS: John A. Wekrly (Supervisor)

(A) 1. Cornell University
Section of Biochemistry, Molecular and Cell Biology
Wing Hall
Ithaca, N.Y. 14853

2. June 1973 - August 1974
3. every weekday, 4 - 10 hours
4. none
5. film badge

(B) 1. Roswell Park Memorial Institute
Dept. of Experimental Biology
666 Elm St.
Buffalo NY 14263
2. Sept. 1974 - June 1978
3. every weekday, 8-9 hours
4. none
5. film badge

(C) 1. State University of New York at Buffalo
Schools of Medicine and Dentistry
Dept. of Pharmacology and Experimental Therapeutics
127 Farber Hall
Buffalo NY 14214
2. July 1978 - June 1980
3. every weekday, 4 - 10 hours
4. < 100 mrem
5. film badge, thyroid scan (^{125}I)

(D) 1. Yale University School of Medicine
Dept. of Internal Medicine
333 Cedar St.
New Haven CT 06510
2. July 1980 - Oct 1982
3. every weekday, 4 - 12 hours
4. < 400 mrem
5. film badge on whole body + wrist (^{32}P)

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5)	^{14}C	20 μCi	6 months, transport studies
6)	^{22}Na	20 μCi	1½ years, transport studies
7)	^{36}Cl	20 μCi	1½ years, transport studies
8)	^{42}K	50 μCi	1 day, transport study
9)	^{32}P	2.5 mCi	2 years, studies of hormone-stimulated cellular protein phosphorylation ~~RNA turnover~~

R.P.O. FORM #1

(Must be Completed Before Approval to use Radioactive Materials can be Granted)

Badge #41

OCCUPATIONAL TRAINING AND EXPERIENCE
STATEMENT OF TRAINING AND AGREEMENT

1. NAME CONNIE M. SANDERS SS # 222-44-6037 D.O.B. 11-28-56
2. DEPT. BIOMEDICAL PRODUCTS BLDG. GRL ROOM # 212
3. SUPERVISOR J.C. THOMPSON
4. Previous Employment(s) Involving: Radiation Exposure
   (Include this information on back of this sheet)
   1. Name and Address of Business WILM. MEDICAL CENTER
   2. Dates of Employment 4/81 → 4/82
   3. Periods of Exposure 1 HR per week
   4. Whole Body Exposure, REM < .001 REM
   5. Method of Monitoring your Exposure MONITORING BADGE
5. TYPE AND DATE OF TRAINING | WHERE TRAINED ON JOB/FORMAL | DURATION OF TRAINING

   1) Principle and Practices of Radiation Protection
   2) Radioactivity measurement, monitoring techniques and instruments
   3) Mathematic Basics to Use and Measurement of Radioactivity
   4) Biological Effect of Radiation

   > SEE BACK OF SHEET.

6. Actual Isotopes Used

ISOTOPES	MAXIMUM AMOUNT USED AT ONE TIME	DURATION AND TYPE OF USE
1) ^{125}I	10 μCi	1 year / RIA Kit Form
2)		
3)		
4)		

7. I certify the answers to this questionnaire are true and accurate to the best of my knowledge and belief as of 2-6-84 (Date)

C.M. Sanders (Signature)

8.) APPROVALS: [illegible] 2/6/84 (Supervisor)

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

NAME Connie M. Sanders

TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a) Principles and Practices of Radiation Protection	Univ. of Delaware Clin. Chemistry Course			✓
b) Radioactivity measurement standardization and monitoring techniques and instruments	"			
c) Mathematics and Calculations basic to the use and measurements of radioactivity	"			
d) Biological Effects of Radiation. Experience with Radiation	Wilm. Medical Center	1 week review + 1 year bench experience	✓	

Isotope	Maximum Amt.	Where Experience Was Gained	Duration of Experience	Type of Use
^{125}I	10 uCi / kit	Wilm. Medical Center	1 year	RIA Kits

GLASGOW SITE MANUAL

FOR

RADIATION SAFETY

COPY NO. _____

ASSIGNED TO: _____

Rev. 10/1/87

GLASGOW SITE MANUAL FOR RADIATION SAFETY

TABLE OF CONTENTS

I. PURPOSE

GLASGOW SITE MANUAL FOR RADIATION SAFETY

The purpose of this manual is to insure that all radiation producing devices and materials are used in accordance with Federal guidelines and to protect the individual worker and also the community.

To accomplish this, our

AIM - is to appraise, modify as necessary and maintain our radiation safety program so as to greatly enhance the overall efficiency of the program . . .

IN A WAY THAT -

- spreads the workload through knowledgeable people
- clearly defines specific areas of responsibility
- clarifies and simplifies use and user approval and control
- maintains a sound survey and audit system
- trains (and provides refresher training for) users in a timely and efficient manner
- provides for purchase, receipt, disbursement and inventory control in a timely and efficient manner
- includes non-ionizing radiation producing devices
- facilitates updating of our radiation manual and our NRC license

and

- provides for timely and proper disposal of wastes

SO THAT - employees may be approved to use radiological materials and/or radiation producing devices without risk to their health and safety and the health and safety of their fellow workers and the community while keeping with the standards set by Glasgow and Du Pont and the requirements of our NRC license.

GLASGOW SITE CENTRAL SAFETY & HEALTH COMMITTEE

HEALTH SUBCOMMITTEE

GLASGOW SITE RADIATION SAFETY SUBCOMMITTEE

RADIATION PROTECTION OFFICER

A. T. BERTA X19459

- ADMINISTRATION OF PROGRAM
- MANUAL UPDATE/MAINTENANCE
- NRC LICENSE AND REPORTS
- CENTRAL RECORDS
- COMMITTEE MEETINGS

RADIATION SAFETY SUB-COMMITTEES

RADIATION SAFETY SUB-COMMITTEES

MONITORING & SURVEYS CONTROL	NON-IONIZING RADIATION CONTROL	RADIOACTIVE WASTE CONTROL	RADIOACTIVE MATERIALS CONTROL	TRAINING & INFORMATION CONTROL	USE AND USER CONTROL
PERSONNEL MONITORING AND CONTAMINATION SURVEYS/AUDITS	MICROWAVE, UV, LASER, & OTHER NON-IONIZING SOURCES	CONTROL WASTE DISPOSAL & TRANSFER	CONTROL PURCHASE, RECEIPT, DISBURSEMENT & INVENTORY	PROVIDES INFORMATION & CONTROLS TRAINING OF USERS	APPROVES USAGE & AUTHORIZES USERS FOR SPECIFIC APPLICATIONS
E. J. FRIEDLANDER* X19280	J. D. DOUGLAS X13623	R. R. CHARLTON X13625 AND C. C. WANG* X13578	C. M. SANDERS X13749 AND C. J. JANES* X19863	K. R. HUSKINS X13606 and S. T. Toy X19216	R. A. YATES X19298

*Designate RPO

III. RADIATION SAFETY COMMITTEE RESPONSIBILITIES

The Radiation Safety Committee (RSC) shall:

- Be composed of members appointed by Management. The Radiation Protection Officer is appointed by the Site Manager and submitted to the NRC for approval.
- Establish and administer a Radiation Protection Program that will provide a high level of radiation protection for employees and full compliance with pertinent regulations.
- Administer overall uses and users of radioisotopes to assure that exposures be kept below permissible levels and as low as reasonably achievable (ALARA).
- Make every effort to maintain radiation exposures and releases of radioactive materials in effluents to unrestricted areas as low as is reasonably achievable within State or Federal guidelines.
- Make safety evaluations of proposed uses of the radioactive materials. Evaluation should include considerations of the adequacy of appropriate supplemental rules; facilities and equipment; operating, handling and emergency procedures; the experience and training of the proposed users.
- Review reports of above-action-level incidents and infractions of any rules or regulations. Review should result in recommendations for appropriate and timely corrective action.
- Most of the work of the committee will be one by circulation of the purchase orders, use, or user request forms to the committee members. It will take at least three members including the R.P.O., or designate, to approve purchase, use or user.
- This committee will meet at least quarterly for review.

IV. RADIATION PROTECTION OFFICER'S RESPONSIBILITIES

The Radiation Protection Officer (R.P.O.) shall:

1. Administer the Radiation Protection Program and also serve as an active member of the RSC.

2. Implement and maintain radiation protection services through the interaction of the various radiation subcommittees as detailed herein.

3. Maintain proceedings from the Radiation Safety Committee meetings.

4. Make reports to the Nuclear Regulatory Commission as required by 10 CFR 19 and 20 or equivalent State regulations.

5. Maintain the Site NRC license and the Site Radiation Safety Manual.

6. Participate in management and NRC audits.

7. A minimum of 10 percent of work time will be spent on Radiation Safety.

V. USE AND USER CONTROL

A. PURPOSE

1. To insure use of radioactive materials only in those laboratories approved for such use, so that radiation exposure can be minimized.

2. To limit use of radioactive materials only to investigators trained in proper procedures to recognize and prevent possible hazardous radiation exposure.

B. DEFINITIONS

1. The term radiation includes all forms of potentially harmful ionizing and non-ionizing radiation. (For non-ionizing radiation see Section XI.)

2. The term ionizing radiation includes all forms of high speed electrons (particles), energetic protons (x and gamma rays), and energetic nuclear particles (primarily prctons, neutrons, and alpha particles).

C. PROCEDURE

1. All area procedures which require the use of radiation equipment, sources, and materials must be submitted in detail, and approved prior to use. See attachment I for General Site Rules which must be addressed relating to Radioisotope Safety. Contact the chairman of the Use and User Subcommittee, presently R. A. Yates, Bldg. 300. Area Procedures must also include:

   a) Type(s) of radiation.

   b) List of radiation material by-products.

   c) Safety rules, safety equipment and monitoring that will be used.

   d) List of employees approved to use radiation producing equipment, sources or materials.

   e) Required personnel safety and monitoring equipment and frequency of use to ensure no contamination has occurred at end of procedure/experiment.

   f) Emergency procedures should a spill or contamination occur.

   g) Disposal technique in accordance with applicable regulations.

2. All new or modified laboratories or equipment to be used in the above procedure will be inspected and approved by members of the Radiation User Control Sub-Committee before use.

3. All use of radioactive materials or sources must be under the control of an approved permanent Du Pont employee.

4. Approved users for radioisotopes include only those who have completed the Glasgow site Radioisotope training seminar, or equivalent, and have had actual use experience.

   a) R.P.O. Form #1, side 1 "Occupational Training and Experience" must be filed for approval, to be eligible for inclusion as an approved user. The form presumes prior experience with radiation.

   b) Without prior experience, (refer to section IX "Training") the "Radioisotope Training Checklist" on R.P.O. Forms 2, 3, & 4 must also be completed. First time users will be granted conditional approval for use of radioisotopes under the direction of experienced users until approved for full use following resubmission of the signed form and approval.

   c) By governmental requirements, approved users must take a refresher course every two years. See Section IX.

5. Low Level Quantities Handling

   a) By the nature of our radioisotope license, there are no true exempt quantities. As an operational procedure, however, and as long as radioisotopes are handled by an approved user in an approved low-level laboratory, the following quantities of radioisotopes can be handled without specific approval restrictions:

      H^3 (Tritium) 1 mCi
      C^{14} (Carbon-14) 1 mCi
      S^{35} (Sulfur-35) 1 mCi
      I^{125} (Iodine-125) 100 uCi
      p^{32} (Phosphorous-32) 100 uCi

   b) The total radioactivity in any low-level radioactivity laboratory of all radioisotopes can be no more than the proportion of each isotope relative to its limit, and when summed is equal to or less than 1.

   c) All isotopes, of course, must be handled with the containment and disposal procedures appropriate and required for each.

6. Total quantity handling for any one use, without prior approval.

   a) All materials in this category must be handled only in an approved high radiation area (i.e. GRL Lab 251).

   b) Radioisotope quantities are limted to:

      I^{125} and p^{32} 5 mCi
      C^{14} and S^{35} 10 mCi
      H^3 20 mCi

   c) Specific approval is required (see IIIA) for the use of larger quantities of radioisotope, or for unlisted radioisotope.

   d) Total approved radioisotope quantity for the specific area as a whole cannot be exceeded.

GENERAL RULES FOR

RADIATION SAFETY IN RADIOISOTOPE LABORATORIES

1. EQUIPMENT: All equipment designated for radioactive use must not leave the assigned area.

2. ABSORBENT PAPER: Use polyethylene-backed absorbent paper to cover working surfaces, and use drip trays lined with absorbent paper for handling appreciable quantities of liquid, to confine any spillage.

3. TRANSPORTING OF LIQUIDS: Liquids in flasks, test tubes, and counting vials must be in a secondary unbreakable container when transporting from one laboratory to another.

4. PIPETTING: Pipetting of radioactive solutions by mouth is prohibited. Also, use pipetting devices for additions of non-radioactive materials in radioisotope usage areas.

5. SMOKING, EATING OR DRINKING: Not permitted in laboratory areas where radioactive materials are stored or handled.

6. STORAGE: Food and/or beverages in a refrigerator used for storage or radioactive materials are not permitted.

7. GLOVES: Wear protective gloves when handling unsealed sources of radioactive materials and whenever hand contamination is probable. Gloves must not leave the area.

8. PROTECTIVE LABORATORY CLOTHING: Protective clothing used in handling radioactive materials must not be worn outside of the laboratory to public areas such as the library, cafeteria, conference rooms, or offices.

9. DISCARDING VIALS: Retain liquid scintillation counting vials in trays for pick-up; do not place in solid waste.

10. BULK LIQUID WASTE: If liquid waste is acidic, pH 5, adjust pH to between 5 and 9.

11. AMOUNT, KIND OF ISOTOPE IN WASTE: Identify isotopes and estimate amounts in liquid and solid waste, and enter information on radioactive material tag for waste pick-up.

12. CONTAMINATION CHECKS: For equipment, lab surfaces, clothing, skin, use a filter paper and/or cotton swab smear and count it in a liquid scintillation count for beta emitters or a crystal scintillation counter for gamma emitters.

13. SPILLS: Contain spill, then notify member of radiation committee of any spill of radioactive material before attempting clean-up.

14. PERSONNEL CHANGES: Notify Use & User Subcommittee of changes in personnel and of significant changes in laboratory experiments affecting procedures or increased in amounts used.

15. SIGNS AND LABELS: Use appropriate standard radioactive signs and/or labels, stickers, or tape on outside doors of area, on storage refrigerator/freezers, on storage and working containers, on waste containers, and on surfaces demarking areas where storage/use is confined.

16. EYE PROTECTION: Eye protection is required for all laboratory work in accordance with Du Pont safety procedures.

17. CLEANUP/CARRYOVER: Isotope work areas shall be cleaned before the end of each day. When it is necessary to postpone cleanup at the end of the workday, an appropriate sign shall be posted and the area locked or otherwise secured from the general public. This will be done by a Du Pont lockout sign on the door and radiation tape over the lock. Decontamination must be completed prior to starting a new operation. Intermittent surveys will be made by the user and survey data wil be kept for two years.

18. VENTILATION: As much radioactive work as possible should be performed in an appropriate vented enclosure. Operations which may give rise to airborne contamination must be performed in an appropriate vented enclosure. Any operation that may cause a particulate or volatile discharge in excess of allowable limits into the stack system must be absorbed or trapped in an appropriate medium to prevent discharge into the environment in accordance with Code CRF 10 20.106.

19. SHIELDING: Every attempt shall be made to shield sources of radiation so that the workers and other laboratory inhabitants will not be unnecessarily exposed to radiation. Appropriate shielding should be used, e.g. acrylic shields for high energy beta particles and lead shielding for gamma radiation.

20. LABELLING: All radioactive materials and operations must be properly labelled with an appropriate and standard radioactive warning sign (10 CFR 20.203) and the user's name, data and the radioactive contents.

21. DEFECTIVE INSTRUMENTATION: Any radiation instrumentation found to be defective or suspected to be malfunctioning shall be tagged out of service and reported immediately to the Radiation Protection Officer or corrected.

22. PROTECTIVE GLOVES: Protective gloves must be worn when handling unsealed sources.

VI. RADIOISOTOPE PURCHASING AND INVENTORY CONTROL

A. PURPOSE

Aim - to control the purchase, receipt and disposal of radioisotopes in a way that identifies primary responsibility for the radioisotopes and regulates quantities in accordance with the Site NRC license.

B. DEFINITIONS

Low Level Quantities - Purchase orders for total quantities of I-125 and P-32 less than 100 Ci and H-3 and C-14 less than 500 Ci will be exempt from the required approval by three members of the Site Radiation Safety Committee.

Primary Responsibility - Primary responsibility is assigned by RPO Form #6 which must accompany all radioisotope purchase requests. Primary responsibility can only be assigned to a permanent Du Pont employee on the approved users list.

C. PROCEDURE

1. Purchase Orders for Radioisotopes

   a) Requests for radioisotopes are made by submitting the purchase request and RPO Form #6 to the Radioactive Material Control Coordinator who will, upon approval, authorize and release the order.

   b) Standing (blanket) purchase orders for radioisotopes are made by submitting the purchase request and RPO Form #6 to the Radioactive Material Control Coordinator who will, upon approval, authorize and release the order. The purchase order must state the total quantity requested, the quantity per release and the period the purchase order covers (not to exceed one year). Interim releases may be made against the purchase order by the person having primary responsibility.

2. Receipt of Isotope

   All incoming radioisotope shipments shall be inspected by the Radioisotope Inventory Control officer or designate according to Federal requirements (10 CFR 20.205). Records of all incoming radioisotope shipments shall be maintained by the Radioactive Material Control Coordinator.

3. On a quarterly basis the Radioisotope Inventory Officer will check the results of the inventory survey with the records of the Waste Disposal Officer to confirm compliance to Site standards.

4. Audits

   Audits of radioisotope inventories will be conducted on a quarterly basis. Audit records will be maintained by the Radioactive Material Control Coordinator.

VII. PERSONNEL MONITORING

A. PURPOSE

Aim - to monitor radiation exposure of isotope users in a way that detects exposure levels above the minimum allowable so that individuals can be informed of such exposures and corrective measures taken.

B. PROCEDURE

1. External Dosimetry

   a) Film badges will be worn by all individuals while working with I-125, I-131, P-32 or any other applicable radioactive substance. Individuals working with mCi quantities of P-32, or quantities of radioiodine (I-125 or I-131) greater than 100 uCi or any quantity of Cr51 will also wear ring badges. Badges will be changed on a monthly basis. Individuals having an exposure greater than 100 mRem in a month shall be notified.

2. Internal Dosimetry

   a) Thyroid

      i. All individuals on Site will have a baseline reading before working with volatile iodine. Any employee who works with quantities of volatile radioiodine (I^- or I_2) in excess of 100 uCi, or with quantities of chemically combined I^- in excess of 100 uCi, shall have their thyroid checked for radioactivity before use, then between 6-72 hours after use, or at two-week intervals in cases of repeated exposure. Thyroids shall be monitored quarterly for all other users of I-125.

      ii. These test results will be communicated to the employee, and also to the Coordinator for Personnel Monitoring (E. J. Friedlander) and will be placed in the employee's permanent records in compliance with 10 CFR, 19.13.

   b. Urine

      i. All persons working with quantities equal to or greater than 1 mCi per month of any radioisotope are required to monitor their urine at two-week intervals and keep records. A urine sample shall be monitored for radioactivity and records kept before and after each use of 25 mCi or more of any radioisotape. Urine shall also be monitored from users in areas showing the presence of removable contamination in excess of 10,000 dpm per 100 square centimeters. Results shall be communicated to the employee and also kept in the employee's permanent records. Evidence for the presence of contamination in urine indicating exposure of the whole body of an individual to 5 Rems or more irradiation during the biological lifetime of the isotope shall be reported in writing to the NRC per 10 CFR, 20.403 and 20.405.

      ii. Any person working with radioactive materials shall submit a urine sample upon request from the R.P.O., or designate.

VIII. CONTAMINATION SURVEYS AND AUDITS

A. PURPOSE

Aim - to monitor areas of radioisotope usage in a way that identifies contaminated equipment and/or laboratory area so that decontamination may be successfully performed and a safe working environment may be maintained.

B. PROCEDURE

1. Routine Surveys

   a) Users will survey their work area and equipment at the end of each day's experimentation. This will be done either by wipe test, or by using a direct readout meter where applicable. Items to be surveyed include work bench, pipets, spill tray, refrigerator handle, floor, door knob, etc.

      i. Wipe tests will be done by thoroughly swabbing an area of approximately 100 cm^2 with a disposable cotton swab wetted with 70% ethanol. An area is defined as contaminated if a wipe test results in CPM 2X background. The area must be decontaminated and shown by wipe test to be free of contamination.

      ii. Radioactivity in excess of 200 dpm net shall be reported to laboratory occupants, decontaminated, and verified by the user. Areas with wipe tests showing, for any isotope more than 2000 dpm/100 cm^2 on the floor, or 5000 dpm/100 cm^2 on any other surfaces, including safety clothing (e.g., lead aprons, face shields) shall be closed to use or occupancy except during decontamination procedures.

   b) Users will maintain a record of surveys for each area authorized for isotope usage. This record must be readily available for audit by the radiation safety committee or the NRC.

2. Quarterly Audits

   a) The Chairperson of the Monitoring and Surveys Control Committee or designate will conduct quarterly contamination surveys of all areas that are authorized for isotope use. These will include wipe tests of floors, bench surfaces, sinks, and other objects as appropriate. The areas will also be scanned with a G.M. monitor (i.e. Victoreen Model #490, with Victoreen Probe Model #489-35, or other appropriate thin-walled probe) as a double check.

IX. TRAINING

Training will be provided for all personnel exposed to radioisotopes on the Site. Procedures for radioisotope use will be in accordance with the guidelines of the Site Radiation Safety Manual and in compliance with all relevant Federal and/or State regulations and guidelines.

The mechanism for obtaining radioisotope use authorization requires adherence to the following training related procedures:

Step 1. The Applicant makes contact with the Training and Information Control Sub-Committee Chairperson (or designate) to initiate the completion of RPO Form #3. As part of this process, completion of RPO Form #1 will be necessary. Training and Information Control will

(a) assign an Area Radiation Training Coordinator,
(b) file RPO Form #1 with Use and User Control,
(c) enroll Applicant in formal training course, and
(d) sign and file RPO Form #3 and request Applicant to provide a copy to the Area Radiation Training Coordinator.

Step 2. The Applicant makes contact with the Area Radiation Training Coordinator to initiate the completion of RPO Form #4. The Area Radiation Training coordinator will

(a) conduct the detailed training,
(b) establish complaince with requirement to attend the formal training course,
(c) together with Use and User Control and Applicant's Supervision assign the Approval Status, and
(d) sign and file RPO Form #4 with Use and User Control.

Approval for use of radioisotopes on Site is subject to periodic refresher training for all personnel. It is anticipated that for most purposes, biannual attendance at the Site-sponsored formal Radiation Safety Training course will be the MINIMUM requirement. More frequent attendance may be made available at the discretion of the employee's Supervision and/or the Site Radiation Safety Committee.

X. CLASSIFICATION AND DISPOSAL OF RADIOACTIVE WASTES

A. PURPOSE

To assure that radioactive wastes are packaged, transferred and transported in a safe and timely manner, so that the Site is in full compliance with regulations set forward by or with the following organizations:

1. United States Nuclear Regulatory Commission.
2. United States Department of Transportation.
3. Delaware Department of Natural Resources and Environmental Control.
4. Wastes Disposal States.
5. Wastes Disposal Contractors.

B. GENERAL GUIDELINES

IMPORTANT NOTE:

For those radioactive wastes which are also biohazard and/or chemical hazard, refer to the Site procedures for Biohazard Wastes Disposal and procedures for Hazardous Chemical Disposal. In addition to this procedure for safe disposal, it is mandatory that after the biohazard is eliminated (e.g. by sterilization), these materials are disposed of as radioactive wastes according to the following procedures.

1. Radioactive wastes are to be placed only in containers approved by the R.P.O. or designate, and labelled with Site approved radiation labels.
2. Only materials known to be or suspected of being radioactive are to be placed in these containers.
3. Shipping boxes and packing materials for radioactive materials are to be disposed of as non-radioactive wastes after the radioisotopes are removed and the packages are found to be free of contamination. The user shall assure that all radioactive labels are defaced prior to disposal.
4. Users must provide information that pertains to the type and approximate quantity of the wastes in a designated manner (described below), so that they can be processed for transportation by the R.P.O. or his designates.

5. No liquid wastes, including potentially contaminated rinses of glasswares and apparatus, may be poured down the sink drain, unless ALL the following conditions are met:

   a) The liquid must be soluble or dispersable in water.

   b) There must be no specific hazardous restriction.

   c) The radioactivity must be within limits specified by 10 CFR 20.303 or NRC Regulations (see Appendix I).

   d) Any amount so disposed is reported to the Radioactive Materials Control Subcommitte Chairperson for Inventory Control.

   e) There must be written approval by the R.P.O.

6. Rules for handling radioactive waste may change from time to time. The R.P.O. or his designate will continuously update all users on these change. It is the users' responsibility to know, understand and follow current instructions and operating procedures provided by the R..P.O.

C. PROCEDURES

1. Dry Solid Materials (DSM):

   Dry solid materials include gloves, wipes, glassware, pipettes, syringes, paper, empty bottles, empty scintillation vials, etc. Designated containers, appropriately labelled, are to be available in all laboratories where radioisotopes are used. The container must be lined with a 2 mil plastic liner. All sharp object should be wrapped in puncture-resistant material before discarding.

   A log sheet must be maintained at each container, so that the type and approximate quantity of the waste contents can be recorded, when the container is nearly full, complete the "Caution--Radioactive Material" stringed tag provided with the container by indicating:

   a) User's name and date.
   b) Radioisotope contents.
   c) Approximate total quantity of radioactivity.
   d) Any other related hazardous information.

   Deliver the sealed bag to designated staging area (eg. 55 gal drum in each laboratory or building). The R.P.O. shall arrange pick-up's according to a predetermined schedule.

2. Small Volume Liquid (SVL):

   A. SVL-A: Aqueous wastes less than 50 ml should be stored in their original bottles, securely capped, and kept at designated areas until pick-up.

   B. SVL-S: Organic scintillation liquids less than 50 ml should be kept in their original vials, securely capped and stored in the original trays. The trays should be maintained in a designated staging area until pick-up.

Vials containing the following radionuclides must be stored on separate trays:

a) C-14 and H-3.
b) I-125 and other gamma emitters.

3. Large volume liquid:

Liquid wastes larger than 50 ml are included in this category. Special waste bottles, eg. one gallon Nalgene bottles, will be maintained in each laboratory. Separate bottles should be used for Gamma (eg I-125) and Beta (eg H-3 and C-14) emitters. Aqueous and organic liquids must be kept in separate bottles. When the bottles are nearly full, complete the "Caution--Radioactive Material" stringed tag provided with the container with the following information:

a) User's name and date.
b) Radioisotope contents.
c) Approximate quantity of radioactivity.
d) Principle solvent.
e) Any associated safety hazard.

Measure the pH of the contents with a pH paper. If the pH is lower than 5, add base to neutralize any acid in the solution. Acidic liquids which are absorbed and shipped in metal drums may cause leakage during the shipment.

The R.P.O. will arrange for pick-up according to a predetermined schedule.

APPENDIX 1

DISPOSAL BY RELEASE IN SANITARY SEWAGE SYSTEMS

Summary of 10 CFR 20.303:

No licensee shall discharge licensed material into a sanitary sewage system unless:

A. It is soluble or dispersible in water.

B. Amount discharged in any one day does not exceed the larger of:

1. When diluted by the average daily quantity of sewage water released into the sewage system, the concentration of the byproduct materials does not exceed those listed in column 1 of the table.

2. The total quantity of radioactivity discharged does not exceed those listed in column 2 of the table.

C. Amount released in any one month period, diluted by the average monthly sewage water released, does not exceed the concentration listed in column 1 of the table.

D. Released amounts are reported to the Radioactive Materials Control Subcommittee Chairperson for Inventory Control.

E. The gross amount of all nuclides, except H-3 and C-14, discharged in one year shall not exceed 1 Ci. The amount of H-3 discharged shall not exceed 5 Ci/yr. The amount of C-14 discharged shall not exceed 1 Ci/yr. with the exception of human excreta, which is exempt from such limit.

LIMITS OF RADIOACTIVE BYPRODUCT MATERIAL DISCHARGED INTO THE SEWAGE SYSTEMS

Nuclides Names	Column 1 Concentration (uCi/ml)	Column 2 Quantity (uCi)
C-14	S 2X10E-2 I 1X10E-2	1,000
Co-57	S 2X10E-2 I 1X10E-2	-
H-3	S 1X10E-1 I 1X10E-1	10,000
I-125	S 4X10E-5 I 6X10E-3	10
P-32	S 5X10E-4 I 7X10E-4	-
S-35	S 2X10E-3 I 8X10E-3	1,000

S: Soluble; I: Insoluble

XI. NON-IONIZING RADIATION SAFETY

A. PURPOSE

1. To control employee exposure to hazardous non-ionizing radiation through industry standard classification, testing, labeling, and periodic evaluation.

2. To insure safe operation of hazardous non-ioning radiation equipment through training, and controlled access.

B. DEFINITIONS

1. The term electromagnetic radiation -- the propagation of varying electric and magnetic fields through space at the speed of light.

2. The term LASER -- an acronym that means Light Amplification by Stimulated Emission of Radiation.

3. The term laser system -- includes any laser source, regardless of type, power, wavelength, or physical size (some Laser sources amplify invisible light).

4. The term ultraviolet radiation (UV) -- is an invisible radiant energy that is produced by natural and artificial sources and accompanies much visible light. Examples of this includes surlight, and light that is radiated from germicidal lamps, photocopiers, greenhouse lamps, strobe lamps, and UV inspection boxes.

5. The term controlled access -- means that employee exposure to any hazardous non-ionizing radiation equipment is controlled through the use of signs, warning devices (audible or visual), or barriers.

6. The term hazard evaluation survey -- means an evaluation of the hazards to personnel working or remaining with the vicinity of electromagnetic radiation equipment.

C. PROCEDURE

1. All lasers, microwave ovens, and ultraviolet (UV) lamps generate electromagnetic radiation. The following rules shall be strictly enforced to insure the safe operation of this type of equipment and safety of all personnel:

   a) The chairman, or alternate, of the Non-Ionizing Radiation Control Committee must be contacted:

      i. For approval of all purchases of laser systems and microwave ovens (submit RPO Form #8).

      ii. To inspect, test, classify and label all laser systems. This will also apply to ultraviolet light sources that are deemed by the committee to be hazardous.

iii. To perform a hazard evaluation survey of areas designated for use of a laser system.

iv. To determine if protective equipment and/or clothing is required for the safe operation of a laser system.

b. A representative of the Non-Ionizing Radiation Control Committee must be contacted to inspect, test, and label all microwave ovens intended for use.

c. A representative of the Site Safety Office must be contacted to determine if a training program is required for employees that are authorized to use a laser system.

2. The Non-Ionizing Radiation Control Committee will perform periodic evaluation surveys of areas that are subjected to high levels of electromagnetic radiation and insure controlled access where deemed necessary.

XII. RADIATION INCIDENT HANDLING

A. In the Event of a Radiation Incident:

The Radiation Protection Officer, or designate, will take appropriate action in one or more of the following ways:

- May require the area to convene a Serious Incident Investigation (Refer to Site Safety Manual Standard Procedure SP-7).
- Investigate and document the degree and cause of contamination and/or exposure.
- Post and isolate the contaminated area and/or equipment.
- Evaluate the degree of exposure (internal and external) and/or contamination.
- When indicated, suspend operations in a laboratory area and/or suspend work of an individual.
- Schedule and supervise appropriate decontamination procedures.

The User shall do the following:

(FOR MINOR SPILLS less than 1mCi or 10 x levels in Table I, whichever is lower.)

- NOTIFY: Notify persons in the area that a spill has occurred.
- PREVENT THE SPREAD: Cover the spill with absorbent material.
- CLEAN UP: Use appropriate disposable gloves and remote handling tongs where applicable. Carefully fold the absorbent paper and pad. Insert into a plastic bag and dispose of in the radioactive waste container. Also insert into the plastic bag all other contaminated materials such as disposable gloves.
- SURVEY: Wipe test where applicable or with a low-range, thin-window G-M survey meter, check the area around the spill, hands, and clothing for contamination.
- REPORT: Report incident to their line management and to the Radiation Protection Officer or designate.

(FOR MAJOR SPILLS exceeding 1 mCi or 10 x levels in Table I, whichever is lower)

- CLEAR THE AREA: Notify all persons not involved in the spill to vacate the room.
- PREVENT THE SPREAD: Cover the spill with absorbent material, but do not attempt to clean it up. Confine the movement of all personnel potentially contaminated to prevent the spread.

- SHIELD THE SOURCE: If possible, the spill should be shielded, but only if it can be done without further contamination or without significantly increasing your radiation exposure.

- ISOLATE THE AREA: Barricade the area and restrict access.

- CALL FOR HELP: Notify the Radiation Protection Officer immediately.

RADIATION PROTECTION OFFICER: Andrew T. Berta
OFFICE PHONE: (302) 451-9459
HOME PHONE:

ALTERNATE NAMES AND TELEPHONE NUMBERS DESIGNATED BY RADIATION SAFETY OFFICER:

DESIGNATE RADIATION PROTECTION OFFICER Chi-Chin Wang
OFFICE PHONE: (302) 451-3578
HOME PHONE:

DESIGNATE RADIATION PROTECTION OFFICER: Ernest J. Friedlander
OFFICE PHONE: (302) 451-9280
HOME PHONE:

DESIGNATE RADIATION PROTECTION OFFICER C. Jack Janes
OFFICE PHONE: (302) 451-9863
HOME PHONE:

- PERSONNEL DECONTAMINATION: Contaminated clothing should be removed and stored for further evaluation by the Radiation Protection Officer. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.

- Require the area to convene a Serious Incident Investigation.

TABLE I

CLASSIFICATION OF POTENTIAL RADIOACTIVE SPILLS
BY TYPE, CONCENTRATION, AND AMOUNT

Type	Classification (level)	Concentration	Amount
liquid	low	@ 1 uCi/l. (2 x 10 dpm/ml)	Less than 100 uCi
	intermediate	@ 1 mCi/l. (2 x 10 dpm/ml)	100 uCi-1 mCi
	high	@ 1 Ci/l. (2 x 10 dpm/ml)	More than 1 mCi
solid	low	@ 10 uCi/gm	
	intermediate	@ 1 uCi/gm	
	high	@ 1 mCi/gm	

Limitation: These levels do not take into account the different radiotoxicities of the various radionuclides. See Section XII, Appendix I. For tritium, increase the above 10-fold.

See Section XII, Appendix I, Page 2 for classification of radionuclide hazards by measured external radiation level.

RADIOISOTOPES CLASSIFIED BY HAZARD LEVEL

In the listing on the following page, a large number of radioisotopes are grouped according to relative overall free form hazard level ranging from "low" to "very high." The quantities of radioisotopes in these four groups that could be considered as "low" to "intermediate" amounts are given below.

HAZARD GROUP	LOW TO INTERMEDIATE QUANTITY uCi
1. (very high hazard)	0.1
2. (high hazard)	10
3. (hazardous)	100
4. (low hazard)	1000

RADIONUCLIDE HAZARDS GROUPING

(Alphabetical order within groups)

Group 1 (Very High Hazard)

227-Ac, 241-Am, 242m-Am, 243-Am, 249-Cf, 250-Cf, 251-Cf, 252-Cf, 254-Cf, 242-Cm, 243-Cm, 244-Cm, 245-Cm, 246-Cm, 248-Cm, 254-Es, 255-Es, 237-Np, 231-Pa, 210-Pb, 210-Po, 238-Pu, 239-Pu, 240-Pu, 241-Pu, 242-Pu, 223-Ra, 226-Ra, 228-Ra, 227-Th, 228-Th, 230-Th, 230-U, 232-U, 233-U, 234-U.

Group 2 (High Hazard)

228-Ac, 110m-Ag, 242-Am, 211-At, 140-Ba, 207-Bi, 210-Bi, 249-Bk, 45-Ca, 115m-Cd, 144-Ce, 253-Cf, 36-Cl, 247-Cm, 60-Co, 134-Cs, 137-Cs, 253-Es, 254m-Es, 152y-Eu, 154-Eu, 255-Fm, 256-Fm, 181-Hf, 125-I, 126-I, 129-I, 131-I, 133-I, 135-I, 114m-In, 192-Ir, 54-Mn, 22-Na, 230-Pa, 212-Pb, 244-Pu, 224-Ra, 106-Ru, 124-Sb, 125-Sb, 46-Sc, 89-Sr, 90-Sr, 182-Ta, 160-Tb, 127m-Te, 129m-Te, 234-Th, 204-Tl, 170-Tm, 236-U, 91-Y, 95-Zr.

Group 3 (Hazardous)

105-Ag, 111-Ag, 244-Am, 41-Ar, 73-As, 74-As, 76-As, 77-As, 196-Au, 198-Au, 199-Au, 131-Ba, 7-Be, 206-Bi, 212-Bi, 250-Bk, 82-Br, 14-C, 47-Ca, 109-Cd, 115-Cd, 141-Ce, 143-Ce, 38-Cl, 57-Co, 58-Co, 51-Cr, 131-Cs, 136-Cs, 64-Cu, 165-Dy, 166-Dy, 169-Er, 171-Er, 152h-Eu, 155-Eu, 18-F, 55-Fe, 59-Fe, 254-Fm, 72-Ga, 153-Gd, 159-Gd, 197-Hg, 197m-Hg, 203-Hg, 166-Ho, 132-I, 134-I, 115m-In, 116m-In, 190-Ir, 194-Ir, 43-K, 85m-Kr, 88-Kr, 140-La, 177-Lu, 52-Mn, 56-Mn, 99-Mo, 24-Na, 93m-Nb, 95-Nb, 147-Nd, 149-Nd, 63-Ni, 65-Ni, 239-Np, 185-Os, 191-Os, 193-Os, 32-P, 223-Pa, 203-Pb, 103-Pd, 109-Pd, 147-Pm, 149-Pm, 142-Pr, 143-Pr, 191-Pt, 193-Pt, 197-Pt, 243-Pu, 86-Rb, 183-Re, 186-Re, 188-Re, 105-Rh, 220-Rn, 222-Rn, 97-Ru, 103-Ru, 105-Ru, 35-S, 122-Sb, 47-Sc, 48-Sc, 75-Se, 31-Si, 151-Sm, 153-Sm, 113-Sn, 125-Sn, 85-Sr, 91-Sr, 92-Sr, 96-Tc, 97m-Tc, 97-Tc, 99-Tc, 125m-Te, 127-Te, 129-Te, 131m-Te, 132-Te, 231-Th, 200-Tl, 201-Tl, 202-Tl, 171-Tm, 240-U, 48-V, 181-W, 185-W, 187-W, 135-Xe, 90-Y, 92-Y, 93-Y, 175-Yb, 65-Zn 97-Zr, 69-m-Zn.

Group 4 (Low Hazard)

37-Ar, 249-Cm, 58m-Co, 134m-Cs, 135-Cs, 71-Ge, 3-H, 113m-In, 114-In, 115-In, 116-In, 85-Kr, 97-Nb 144-Nd, 59-Ni, 191m-Os, 193m-Pt, 197m-Pt, 87-Rb, 187-Re, 103m-Rh, 147-Sm, 85m-Sr, 96m-Tc, 99m-Tc, nat.-Th, 232-Th, nat.-U, 235-U, 238-U, 131m-Xe, 133-Xe, 133m-Xe, 91m-Y, 69-Zn, 93-Zr.

XIII. SPECIAL INSTRUCTIONS

A. Special Safety Instructions Pertain to Users of Millicurie Quantities of P-32

- Quantities of P-32 in excess of 1 mCi must be used with special precautions to prevent excessive exposure of skin or eyes to strong Beta-radiation as well as ingestion. Safety glasses are required. No eating, drinking or smoking in the laboratory.

- A portable monitor with a thin-window G.M. probe will be used to survey work areas during and at the conclusion of each procedure.

- All portable equipment must be monitored for contamination before being removed from the laboratory.

- Shoes, lab coats and hands must be monitored before leaving the laboratory area. The lab coat must be left in a lab area.

- P-32 radioactivity on surfaces and equipment in excess of 500 cpm net, as determined with a portable monitor with a 1-inch diameter G-M thin window probe, will be decontaminated. Decontamination of removable activity will be confirmed by wipe tests.

- Film badges (TLD) will be worn by all individuals working with P-32. Ring badges will be worn by individuals working with mCi quantities of P-32 and urine samples submitted as required (use of 10 mCi per month if in a vented hood, otherwise 1 mCi per month).

- Every reasonable attempt should be made to prevent unnecessary exposure by use of suitable thick plastic screens which absorb Beta-particles and prevent generation of secondary x-rays.

- A "dry run" will be required before performance of an unfamiliar procedure employing P-32. The R.P.O. or a member of the RSC shall also be present during initiation of new procedures using more than 1 mCi of P-32.

B. Use of Radioiodine Requires Special Procedures

Radioiodine is readily concentrated by the thyroid gland. For example, about 30% ingested I-125 is deposited in the thyroid and remains there with a biological half-life of 41 days (the physical half-life of I-125 is 60 days). Ingestion of 1 uCi I-125 results in a cumulative dose of 2.3 rem to the thyroid. (The dose from I-131 is somewhat less than this because of its short physical half-life of 8 days).

The NRC mandates strict precautions in handling radioactive iodine and our license requires us to adhere to these. The Site must not release radioactive iodine into the environment in excess of 0.2 dpm/liter (8 x 10^{-11} uCi/ml), and according to law (10 CFR 20.105) the amount of I-125 released in the stack air as measured by a charcoal filter located in stack must not average more than the above figures. Laboratory air must also not exceed 11 dpm/liter (5 x 10^{-9} uCi/ml) and exposure of a worker to this level for one work week would be expected to increase their thyroid burden by 0.05 uCi. Whenever the thyroid burden of a worker exceeds 0.12 uCi of I-125, an investigation must be made to determine the "cause of exposure" (Regulatory Guide 8.20.5). If the burden exceeds 0.5 uCi I-125 (or 0.14 uCi I-131), therapeutic procedures must be initiated to speed the bodies removal of the radioactive iodine.

C. Special Rules for Use of Radioiodine

- Whenever feasible, the researcher will purchase pre-iodinized material to eliminate the potential exposure to free iodine.

- A "dry run" may be required before performance of a new or unfamiliar procedure.

- Laboratory air and hood exhaust air shall be monitored during operations which may release quantities of iodine greater than 5 x 10^{-9} uCi/ml or 8 x 10^{-11} uCi/ml (respectively). Every untested procedure using more than 100 uCi of radioiodine (as iodide or iodine) should be monitored during the initial run. Monitoring will be supervised by the R.P.O. who will employ portable pumps and carbon filters. This will be done in conjunction with the Safety Office.

- Volatile iodine (Iodide or Iodine) will be used in the "Iodination Box" under negative pressure and using a carbon filter.

- Thyroid monitoring must be done 6-72 hours following handling of more than 100 uCi of volatile iodine or iodide, or more than 1 mCi of non-volatile bound iodine.

- A lab coat and protective gloves will be worn when handling quantities of radioactive iodine in excess of 1 uCi (in any form). Double vinyl or latex gloves should be used when handling quartities in excess of 50 uCi.

- Film or TLD badges shall be worn when working with radioiodine (I-125 or I-131) and ring badges shall be worn when handling quantities greater than 500 uCi.

- Exposure of workers to gamma-radiation shall be prevented by proper use of lead shielding.

- Liquid waste containing radioiodine should contain excess alkali and reducing agent. (e.g. 0.05 volumes of a solution of 10% Sodiumthiosulfate in 1M NaOH should be added to the waste container prior to radioactive iodine).

- No more than 500 uC: of radioactive iodine in bound non-volatile form or 10 uC: as I^- or I_2, shall be kept in a laboratory without special precautions taken by the experimenter and the R.P.O. to guarantee minimal exposures to personnel.

- A portable monitor with a thin-window G.M. probe should be used to survey all areas, protective clothing, and equipment used for work with radioiodine.

OCCUPATIONAL TRAINING AND EXPERIENCE
STATEMENT OF TRAINING AND AGREEMENT

(Must be Completed Before Approval to use Radioactive Materials can be Granted)

1. NAME _____ SS# _____ BIRTHDAY _____

2. DEPT. _____ BLDG. _____ ROOM # _____

3. SUPERVISOR _____ DUPONT/CONTRACT _____ PHONE # _____

4. Previous Employment(s) Involving: Radiation Exposure
(Include this information on back of this sheet)

   1. Name and Address of Business

   2. Dates of Employment

   3. Periods of Exposure

   4. Whole Body Exposure, REM

   5. Method of Monitoring your Exposure

5.

TYPE AND DATE OF TRAINING	WHERE TRAINED ON JOB/FORMAL	DURATION OF TRAINING
1) Principle and Practices of Radiation Protection		
2) Radioactivity measurement, monitoring techniques and instruments		
3) Mathematic Basics to Use and Measurement of Radioactivity		
4) Biological Effect of Radiation		

6. Actual Isotopes Used

ISOTOPES	MAXIMUM AMOUNT USED AT ONE TIME	DURATION AND TYPE OF USE
1)		
2)		
3)		
4)		

7. I certify the answers to this questionnaire are true and accurate to the best of my knowledge and belief as of _____
(Date)

_____
(Signature)

8. APPROVALS: _____
(Supervisor)

_____

R. A. Yates

Rev. 10/1/87

INSTRUCTIONS FOR OBTAINING RADIATION HANDLING APPROVAL

The intent of the Glasgow Site Radiation Handling Approval process is to ensure that all employees who nave a need to work with radionuclides receive adequate safety training. The process entails

- ascertaining the experience and exposure history of the applicant
- providing basic training information
- designating one-on-one supervision by an Area Radiation Training Coordinator for a period of time comensurate with the competency of the applicant
- requiring attendance at a formal Site-sponsored Radiation Training Course on at least a biannual basis.

The various requirements of the approval process are administered by the indicated Subcommittee Chairperson (or their designate) of the Site Radiation Safety Committee.

REQUIREMENT	SUBCOMMITTEE APPROBATION
Completed RPO Form #1 and RPO Form #3	Training and Information Control _____
Completed RPO form #4, Sides 1 and 2 by Area Radiation Training Coordinator	Use and User Control _____

REQUEST FOR APPROVAL TO HANDLE RADIOISOTOPES

This document is to certify that _____ has
(applicant)

I. received a copy of

_____ RPO Form #1

_____ Radiation Safety Committee organization chart

_____ USNRC Rules and Regulations - 10 CFR 19

_____ USNRC Rules and Regulations - 10 CFR 20

II. been instructed to

_____ familiarize self with contents of Site Radiation Safety Manual

_____ return completed RPO Form #1 to the Training and Information Control Chairperson (or designate)

III. viewed the Radiation Safety Series of videotapes

_____ "Introduction to Radiation Safety"

_____ "Laboratory Techniques"

_____ "Emergency Procedures"

IV. been interviewed by the Training and Information Control Chairperson (or designate) to

_____ review information in videotapes

_____ respond to any questions applicant may have

V. been

_____ enrolled in next scheduled Site-sponsored formal Radiation Safety Training Course

_____ assigned to Area Radiation Training Coordinator _____
(name)

VI. completed Sections I, II, III, IV and V.

SIGNATURES _____ _____ DATE _____
(Applicant)

_____ DATE _____
(Training and Information)

AREA RADIATION TRAINING COORDINATOR'S CHECKLIST

USER AUTHORIZATION LEVEL

APPLICANT _____ DATE _____

SUPERVISOR _____

AREA RADIATION TRAINING COORDINATOR (ARTC) _____

NOTE! ARTC will require a copy of completed RPO Form #3 before proceeding.

I. Instruction has been completed in

_____ location of area copy of Radiation Safety Manual

_____ general laboratory safety

_____ rules for preventing personal exposure and laboratory contamination (including personal protective equipment)

_____ location of approved isotope storage and work areas

_____ physico-chemical properties of radioisotopes to be used (including chemical forms, radiation type, ionization energies, half-lives)

_____ personal monitoring (including dosimeter if required)

_____ operation of radiation monitoring/counting instrumentation

_____ radwaste disposal/record keeping

_____ contamination control testing/record keeping

_____ emergency procedures and phone numbers

_____ any special handling procedures/techniques

_____ other -- (list):

II. The applicant has been trained in and is competent to conduct the following specific radionuclide techniques (use additional sheets if necessary):

PROCEDURE	ISOTOPES(S)	AMOUNT

III. Applicant has attended the Du Pont-sponsored formal Radiation Safety Training Course

DATE _____

IV. APPROVAL STATUS

_____ Temporary (Sections I, II completed)

_____ Limited Use (Section I, II, III completed)

_____ Approved User (Section I, II, III completed and proficiency acknowledged by the Area Radiation Training Coordinator and Applicant's Supervisor)

SIGNATURES DATE

_____ _____
(Area Radiation Training Coordinator)

_____ _____
(Use and User Control Chairperson)

_____ _____
(Applicant's Supervisor)

NOTE! SUBMIT THIS FORM TO OBTAIN APPROVAL OR RESUBMIT THIS FORM TO ALTER USE STATUS, TO USE NEW IOSTOPES AND/OR TO APPLY NEW PROCEDURES.

_____
(DATE)

TO: CONNIE SANDERS
RADIOACTIVE MATERIALS CONTROL COORDINATOR
BLDG. 700, MAILBOX 712
X-13749

REQUEST FOR RADIOISOTOPES

Request is hereby made for _____ (amount) of _____ (radioisotope) in _____ (form or agent) for _____ (application). The purchase order must accompany this request.

This is to be used in Bldg. _____, Lab. _____.

The following facilities are available/required:

Hood - material of construction, filter _____

- air flow _____

Protective clothing (lab coat & gloves) _____

Containment Trays _____

Secondary Storage Container _____

Additional safety items available or necessary:

_____ _____

(Note: Ring and body badges are required for I 125 and P 32.

REQUESTED BY: _____ DATE: _____

(Note: Requester must be full time Du Pont employee on the approved Isotope users list and will have primary responsibility for the isotope.)

- -

TO: RADIATION SAFETY COMMITTEE

Approver #		Date	Signature	Comment
1	/__/ Approve /__/ Disapprove			
2	/__/ Approve /__/ Disapprove			
3	/__/ Approve /__/ Disapprove			

Approver #3 route to CONNIE SANDERS

C. M. Sanders

Rev. 10/1/87

Form R.P.O. #7

E. I. DU PONT DE NEMOURS & CO., INC.
WILMINGTON, DELAWARE

_____
(Date)

TO: _____
(NAME)

_____
(SITE LOCATION)

FROM: CONNIE SANDERS
RADIOACTIVE MATERIALS CONTROL COORDINATOR
BLDG. 700, MAILBOX 712
X-13749

RE: RADIOISOTOPE INVENTORY

You are classified as the owner of the following list of radioisotopes.

Please do the following:

(1) Check for accuracy.

(2) Delete any radioisotopes no longer in your possession*.

(3) Add any radioisotopes or radioactive compounds in your possession that are not listed.

(4) Sign, date and return the form.

---

* If you have discarded isotopes for disposal, please indicate the date and activity at time of disposal. If you have transferred the material, please indicate the user who should be listed as the owner and the date of transfer.

ISOTOPE & COMPOUND	DATE REC'D	ACTIVITY	DEPOSITION

C. M. Sanders

Rev. 10/1/87

_____ (date)

R.P.O. Form #8

TO: John D. Douglas, III
Chairman, Non-Ionizing Radiation (NIR) Safety Committee
Bldg. 700, Room 2E12, Ext. 13623

REQUEST FOR LASER EQUIPMENT OR MICROWAVE OVEN

Request is hereby made for _____ (description of item)
for _____ (application). The purchase order must accompany this request.

This is to be used in Bldg. _____, Lab./Room _____.

The following facilities are available/required (for LASER equipment):

Provisions for controlled access _____

Provisions for eye protection _____

Signs & labels prominently displayed _____

Additional safety items available or necessary:

_____

REQUESTED BY: _____ (Name & location) DATE: _____

- -

TO: _____ (Requestors' name & location)

APPROVAL FOR PURCHASE OF NON-IONIZING RADIATION EQUIPMENT

I have read the request form that you submitted for _____;

and,

_____ I approve the order/usage as written. Please comply with Site Safety Manual NIR Safety procedures:

A(1)b, c, d and A(3) (for LASER equip.) or A(2) (for microwave ovens)

_____ I do not approve (see comments).

COMMENTS: _____

_____

Upon receiving this order, please return this portion of this form to me.

_____ Signature (Chairman/alternate NIR Safety Committee)
_____ Date

J. D. Douglas

Rev. 10/1/87

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LMS

PROGRAM CODE: 03610
STATUS CODE: 2
FEE CATEGORY: 3L
EXP. DATE: 19871231
FEE COMMENTS: ----------

LICENSE FEE TRANSMITTAL

A. REGION 1

1. APPLICATION ATTACHED
APPLICANT/LICENSEE: E. I. DU PONT DE NEMOURS & CO., INC
RECEIVED DATE: 871116
DOCKET NO: 3019936
CONTROL NO.: 108045
LICENSE NO.: 07-00455-3R
ACTION TYPE: RENEWAL

2. FEE ATTACHED
AMOUNT: $700
CHECK NO.: 233-032149

3. COMMENTS

SIGNED Porter
DATE 11/30/87

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED ✓)

1. FEE CATEGORY AND AMOUNT: 3L $700

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:
AMENDMENT ----------
RENEWAL ✓
LICENSE ----------

3. OTHER ----------

SIGNED D. Kimberley
DATE 12/1/87