

APPLICATION FOR MATERIAL LICENSE

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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.

APPLICATION FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

DIVISION OF INDUSTRIAL AND MEDICAL NUCLEAR SAFETY
OFFICE OF NUCLEAR MATERIALS SAFETY AND SAFEGUARDS
U.S. NUCLEAR REGULATORY COMMISSION
WASHINGTON, DC 20555-0001

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:

LICENSING ASSISTANT SECTION
NUCLEAR MATERIALS SAFETY BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19408-1415

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

SAM NUNN ATLANTA FEDERAL CENTER
U. S. NUCLEAR REGULATORY COMMISSION, REGION II
61 FORSYTH STREET, S.W., SUITE 23785
ATLANTA, GEORGIA 30303-8931

IF YOU ARE LOCATED IN:

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

MATERIALS LICENSING BRANCH
U.S. NUCLEAR REGULATORY COMMISSION, REGION III
801 WARRENVILLE RD.
LISLE, IL 60532-4351

ALASKA, ARIZONA, ARKANSAS, CALIFORNIA, COLORADO, HAWAII, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEVADA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, OREGON, PACIFIC TRUST TERRITORIES, SOUTH DAKOTA, TEXAS, UTAH, WASHINGTON, OR WYOMING, SEND APPLICATIONS TO:

NUCLEAR MATERIALS LICENSING SECTION
U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
611 RYAN PLAZA DRIVE, SUITE 400
ARLINGTON, TX 76011-8064

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 JURISDICTIONS.

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

- ☐ A. NEW LICENSE
☐ B. AMENDMENT TO LICENSE NUMBER
☒ C. RENEWAL OF LICENSE NUMBER 07-13441-02

2. NAME AND MAILING ADDRESS OF APPLICANT (Include ZIP code)

E. I. duPont de Nemours and Co., Inc.
Stine-Haskell Research Center
P.O. Box 30, Elkton Road (Rt. 2)
Newark, Delaware 19714-0030

3. ADDRESS WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

Stine-Haskell Research Center
P.O. Box 30, Elkton Road (Rt. 2)
Newark, Delaware 19714-0030

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Norman W. Henry, III

TELEPHONE NUMBER

(302) 366-5250

SUBMIT ITEMS 5 THROUGH 11 ON 8-1/2 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.

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING EXPERIENCE.

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSE FEES (See 10 CFR 170 and Section 170.31)

FEE CATEGORY N/A AMOUNT ENCLOSURE \$

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

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, 36, 39, 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 82 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.

CERTIFYING OFFICER - TYPED/PRINTED NAME AND TITLE

Joseph J. Montovino, Manager, Facilities Services

SIGNATURE

Joseph J. Montovino

DATE

9-26-01

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	AMOUNT RECEIVED	CHECK NUMBER	COMMENTS
			\$		
APPROVED BY				DATE	

130368

NMSS/RGNI MATERIALS-002

RECEIVED
REGION 1

2001 OCT -1 PM 1:31

NRC License Renewal Application
Type A License of Broad Scope
September 4, 2001

License No. 07-13441-02
Expiration Date: 10/31/2001
Program Code: 03610

E.I. du Pont de Nemours & Co. (Inc.)
Stine-Haskell Research Center
P.O. Box 30, Elkton Road
Newark, Delaware 19714-0030

Contact:
Mr. Norman W. Henry, III
Radiation Safety Officer
302-366-5250 (voice)
302-451-4545 (fax)
Norman.W.Henry@usa.dupont.com

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Item No. 5: Material to be Possessed

Stine-Haskell Research Center
P.O. Box 30, Elkton Road (Rt. 2)
Newark, Delaware 19714-0030

5(a) Byproduct	5(b) Chemical and/or Physical Form	5(c) Maximum amount of radioactivity which licensee may possess at any one time
A. Any byproduct material with Atomic Numbers 3-83, inclusive, except as shown below:	A. Any	A. Not to exceed 10 millicuries of each radionuclide and 200 millicuries total
B. Carbon 14	B. Any	B. 20 Curies
C. Hydrogen 3	C. Any	C. 20 Curies
D. Iodine 125	D. Any	D. 1 Curie
E. Iodine 131	E. Any	E. 1 Curie
F. Chromium 51	F. Any	F. 1 Curie
G. Phosphorous 32	G. Any	G. 1 Curie
H. Phosphorous 33	H. Any	H. 1 Curie
I. Sulfur 35	I. Any	I. 5 Curies
J. Nickel 63	J. Plated Sources	J. Not to exceed 15 millicuries/foil
K. Chlorine 36	K. Any	K. 200 millicuries

Item No. 5.1: Sealed Sources Possession

Due to the nature of research and development, the number of sealed sources for each radionuclide changes quickly with the needs of the business and the state of the art. The maximum quantity of radioactive material that will be contained in each sealed source and the maximum quantity for each radionuclide are provided in Item #5. At this time, large sealed sources for specific listings by model number and manufacturer, e.g., irradiators, instrument calibrators, are not in possession. Section 6.1 of the application provides the various uses for the sealed sources in our possession.

There are approximately thirty electron-capture detectors used by the research community at Stine-Haskell Research Center. Each of these sealed sources contain not more than 15 mCi Ni-63. These sealed sources are wipe tested on a six-month basis to ensure the integrity of the unit.

Item No. 6.1: Purpose for Use

Stine-Haskell Research Center
P.O. Box 30, Elkton Road (Rt. 2)
Newark, Delaware 19714

The type A specific license of broad scope is intended to accommodate those institutions involved in an extensive radioactive material program where the demand is great for a variety of radionuclides for many uses. The license may authorize any use of byproduct radioactive material by anyone in accordance with review and approval procedures established by the Radiation Safety Committee. Therefore, individuals are not named on the license as users of radioactive material nor are radionuclides limited to narrow, specific uses. However, a general description of the purpose of various uses are:

1. Synthesis of radiolabeled compounds and polymers
2. Metabolic studies in plants and animals
3. Virological and bacteriological research
4. Process development
5. Analytical standards and studies
6. Studies of metabolism, stability and environmental fate of agricultural chemicals and associated products.
7. Pharmacokinetic studies in animals.

Sealed sources will be used for, or in support of research and development. Various uses of byproduct materials as sealed sources are:

1. Reference sources
2. Physical measurements such as gauging, thickness, density, leveling, etc.
3. Electron capture detectors for gas chromatographs
4. X-ray fluorescence excitation sources and x-ray production sources.
5. Static elimination

Item No. 6.2: Field Studies

Stine-Haskell Research Center
P.O. Box 30, Elkton Road (Rt. 2)
Newark, Delaware 19714

Byproduct materials (radiolabeled agriculture chemicals) will be used in small field plots for studies of metabolism, stability, and environmental fate of agricultural chemicals and associated products. No single test plot will use an amount in excess of 10 millicurie of byproduct material. Maximum amount of radioactivity in use at Stine Farm test area at any one time will not exceed 70 millicuries of carbon -14 and 5 millicuries of hydrogen-3.

Crops or soil will be sprayed or treated at various times during the growing season using a small hand applicator and protective clothing. The treated plots will be surrounded by a wire fence and adequately labeled with appropriate NRC radiation symbols and wording. All plant material on test plots will be harvested for additional studies or disposal at the DuPont Experimental Station.

All users will be approved in advance by a Crop Protection representative of the Site Radiation Safety Committee. A record will be maintained of the action taken in approving each use. In addition, this activity will be provided oversight by the Stine Radiation Safety Officer during the annual management audit of the radioisotope program.

Plots used for field studies will be documented to background levels at the conclusion of each field study. At the conclusion of each field study, the procedures provided in Field Plot Test Procedures will be used for decontamination and survey. (See page 8)

Item No. 6.3: Field Plot Test Procedure

The following has been added to DuPont Crop Protection Standard Operating Procedure titled "SOP for Stine Farm C-14 Field Studies":

6.0 PLOT TESTING FOLLOWING EXPERIMENT TERMINATION

6.1 Prior to considering the part of the plot in question to be decommissioned, all caution signage designating the area will remain in place and the following will be done:

6.1.1 All vegetation (if any) will be removed and sent to the Experimental Station for incineration as radioactive waste.

6.1.2 Soil Testing

6.1.2.1 Six to eight soil core samples will be taken to a depth of approximately 18 inches. Cores will be divided into smaller segments. Corresponding segments from each core will be pooled, thoroughly mixed, and analyzed for carbon-14 by combustion and liquid scintillation counting (LSC).

6.1.2.2 Background will be defined by combustion analysis of soil samples taken outside of the plot area. Recovery of carbon-14 from the soil will be determined by analyzing soil from outside the plot area spiked in the lab with a known quantity of carbon-14. Comparison of these results will be made with LSC analysis of vials spiked with the same quantity of carbon-14.

6.1.2.3 Soil will be removed from the plot to the level where soil radioactivity is at background.

6.1.2.4 If soil contains radioactivity in the deepest segment, deeper cores will be taken for analysis, and further soil removed if needed.

6.1.2.5 Removed soil will be sent to the Experimental Station for incineration.

6.1.2.6 Soil removed from the plot will be replaced with soil from outside the plot area.

Item No. 7: Individuals Responsible for Radiation Safety Program

EXECUTIVE MANAGEMENT

The radiation safety function is supported by site Crop Protection management. Research management controls and reviews the radiation safety program through a research representative on the Radiation Safety Committee. Research management also participates in the annual lab audits conducted with the Radiation Safety Committee.

Organization chart enclosed as Attachment 5

RADIATION SAFETY COMMITTEE

The Radiation Safety Committee will consist of members designated as follows:

- Chairperson
- Radiation Safety Officer(s)
- Management Representative, who interacts with and represents senior management, ensuring management involvement.
- Research representative of groups using radioactive materials
- Administrative members who support the radiation safety program, but not as users or as evaluators of radioactive material use requests

The Committee reviews and approves new Committee members nominated by management. Management involvement provides the necessary support and delegated authority. The Radiation Safety Officer (RSO), and Chairman of the RSC are appointed by Management and their credentials submitted to the NRC for approval. A list will be maintained of current committee members and their appropriate training and experience.

NRC approval will be obtained when replacing the Committee Chairperson and RSO(s). The previous chairperson, Len Davis, no longer uses byproduct material under this license. Eric Benner currently serves as chairperson. His credentials to be the chairperson are attached for NRC review and approval. (See page 49.)

Generic qualifications of a research representative:

- Familiarity with license conditions and research programs involving the radioisotopes in the group represented
- Ability to evaluate radioisotope use proposals and audit research and radiation safety programs
- Ability to develop appropriate radiation safety policies, such as ALARA targets
- programs to the research community and management

The Radiation Safety Committee will meet at least four times per year. Official meetings will require a quorum consisting of four members, including at least one of the Radiation Safety Officers. Committee proceedings will be documented and the minutes will be reviewed, approved by the Committee and kept on file.

Most of the Committee's work will be handled through the circulation to individual member of purchase and use requests. When Committee approval is required at least three members will be required to approve purchase and use of radioisotopes. Any single member may challenge a proposed use.

RSC Duties and Responsibilities

- Oversee uses and users of radioisotopes and ensure that exposures will be kept within State and Federal guidelines, and As Low As Reasonably Achievable (ALARA).
- Establish and oversee a Radiation Safety Program that will provide a high level of protection for employees and full compliance with applicable regulations.

Upon the Committee's initiative or upon a user's request, the RSC will evaluate the procedures and programs in place. The ALARA principle and existing license conditions will be used in developing any revisions, or in reaffirming existing procedures. The Committee may revise procedure and program after indicating:

1. The reason for the change
2. The radiation safety issues evaluated
3. How the change will be implemented/communicated

- The RSC will authorize all uses of radioisotopes and will ensure that all radioisotope use complies with applicable NRC regulations. It will review the completed use requests and the principal investigator credentials when approving authorized users and uses of licensed material. Three Committee signatures will indicate Committee authorization.
- The Radiation Safety Officer may directly approve purchases and transfers involving 1 mCi or less of radioisotopes currently used at the Site. The RSO will make available to the Radiation Safety Committee a periodic summary of all purchases so that they can stay informed of the type and level of research activity.

- The criteria for approving radioactive material users include:
 - a. familiar with site NRC requirements applicable to lab users
 - b. familiar with applicable NRC regulations 10 CFR Parts 19 & 20
 - c. understanding of radiation safety principles for handling radioactive material in a safe and appropriate manner
 - d. have attended Site Radioisotope User Orientation and registered for the Basic Radiation Protection Seminar
 - e. all associate users have had appropriate training
 - f. maximum amount of activity per experiment and maximum amount stored in a lab at any one time
- The criteria for approving the associated facilities include:
 - a. appropriate shielding, if necessary
 - b. appropriate portable survey meters
 - c. personnel dosimetry has been issued to users, if necessary
 - d. work areas are clearly designated and labeled
 - e. spill control equipment appropriate for the experiments, e.g., absorbent paper, drip trays, secondary containment
 - f. licensed material above the exempt level will be secured when in storage
 - g. equipment used with radioactive materials is labeled
 - h. engineered controls are appropriate, e.g., chemical fume hood, biosafety cabinets
- Review reports of above-action-level incidents and/or infractions of any rules or regulations and recommend actions or develop policies to ensure a safe workplace. Administrative actions available to the Committee include, but are not limited to, user loss of privileges, additional training, direct supervision of an experienced user, RSO audit of lab operations, management notification.
- Develop procedures and criteria for training and checking the effectiveness of this training for each category of worker.
- Review and approve new Committee members nominated by Management. NRC approval will be obtained for the Committee Chairperson and the RSO of record. A list will be maintained of current Committee members and their appropriate training and experience.
- Use existing Program Audit process to assess compliance and evaluate performance of the user community and the Radiation Safety Office

RADIATION SAFETY OFFICER (RSO)

The Radiation Safety Officer (RSO) of record is Mr. Norman Henry. Mr. Henry has served as RSO of record since 1993. Attached, (Attachment 2, page 50), is a summary of Mr. Henry's training and experience in the safe use and management of radioactive materials.

Augusto Cordova, RSO of record at the DuPont Experimental Station, Jeremiah L. Driscoll, former RSO of record at the DuPont Glasgow Business Center, and Mike Ohm, Assistant RSO at the Stine-Haskell Research Center, serve as backup RSOs.

Duties of the RSO

The RSO shall have the authority to stop work involving radioisotopes where conditions of the license and/or safety standards are not met.

Duties and responsibilities of the RSO (or his/her designate) shall include:

1. Conducting required personnel monitoring and contamination surveys and maintaining all records of these activities. Licensed subcontractors may also conduct surveys.
2. Oversight of ordering, receipt, survey and delivery of arriving licensed material, as specified in 10 CFR 20.1906 and 49 CFR 173
3. Ensuring the proper packaging, labeling, surveys, etc. of radioactive materials leaving the institution.
4. Personnel monitoring program, including the need for and evaluating bioassays, monitoring personnel exposure records, and developing corrective actions for those exposures approaching maximum permissible limits.
5. Training personnel.
6. Supervising disposal or transfer of all radioactive waste, and maintenance of disposal records.
7. Inventory and leak tests of sealed sources.
8. Decontamination
9. Investigating any incidents and responding to any emergencies
10. Maintaining an inventory of all radioactive material.
11. Perform audits of all areas of use and individuals who are authorized to use byproduct material.
12. Maintaining all required records
13. Responding to information requests concerning radiation safety.
14. Serving on the Radiation Safety Committee

Item No. 8: Training for Individuals Working in or Frequenting Restrictions Areas

Initial Site-Specific Training - Unsealed Use

All users of unsealed radioisotopes must attend the Site-Specific "Radiation Safety Orientation" session covering the safe use of radioisotopes. Items covered include:

- Procurement and receipt of radioisotopes
- Hazards and handling precautions for individual radioisotopes
- Employee rights and responsibilities under 10 CFR, Parts 19 and 20
- Locations of pertinent regulations, and licenses
- Material storage and security
- Locations where radioactive material is used and stored
- Radiation Safety Procedures
- Individuals obligation to report unsafe conditions to the RSO
- Applicable exposure limits
- ALARA Policy
- Radiation monitoring (badges)
- Bioassay requirements
- Worker's right to be informed of occupational radiation exposure
- Waste disposal procedures
- Spill clean-up and notification procedures
- Signs and labeling
- Audits, surveys and wipe tests of laboratories

Radiation Protection Seminar

A lecture course, "Radiation Protection Seminar," is given which discusses basic radiation protection in accordance with 10 CFR 19.12. Items such as radioactive decay, biological effects, principles of protection (e.g., time, distance and shielding), and monitoring are covered.

All new users of unsealed radioactive material after 8/1/88 are required to attend the Seminar. Sealed source users are required to attend the Seminar if their device is not eligible to be purchased and used under a general license. The Radiation Safety Office maintains records of this training.

The Radiation Protection Seminar includes the following topics:

- Physics of ionizing radiation
- Modes of radioactive decay
- Sources of ionizing radiation
- Types and categories of radioactive material
- Specific decay schemes

- Kinetics of decay
- Units of activity
- Specific activity
- Interactions with matter
- Unit of exposure and dose
- Biological effects
 - a. Physical-chemical processes
 - b. Tissue and organ effects
 - c. Radiation syndrome
 - d. Chronic effects
 - e. Cancer statistics
- Background radiation, including radon
- Permissible exposure standards (10 CFR 20)
- ALARA Principle
- Radioisotope deposition in the body
- Permissible concentrations and ALI
- Protection through:
 - a. Time
 - b. Distance
 - c. Shielding
 - d. Containment
- Personal protective equipment
- Personal monitoring
- Survey equipment
- Hazard postings
- Protective rules for radioisotope work
- Audits and inspections

Initial Site-Specific Sealed Source Training

All users of sealed sources must attend the Site-Specific "Sealed Source Orientation" session covering the safe use of sealed sources. Items covered include:

- Procurement and receipt of sealed sources
- Hazards and handling precautions for individual sources
- Employee rights and responsibilities under 10 CFR, Parts 19 and 20
- Locations of pertinent regulations, and licenses
- Material storage and security
- Locations where sealed sources are used and stored
- Radiation Safety Procedures
- Individuals obligation to report unsafe conditions to the RSO
- Applicable exposure limits
- ALARA Policy
- Radiation monitoring (badges)

- Worker's right to be informed of occupational radiation exposure
- Transfer, redeployment and disposal procedures
- Exposure incident response
- Signs and labeling
- Audits and leak tests

Refresher Training

In addition, all groups in which radioisotopes are used shall receive periodic documented refresher training on radiation safety rules and practices at least every two years. Refresher training may be provided more frequently based on program or regulatory changes.

ANCILLARY EMPLOYEE TRAINING (NON-USER)

Employees not handling radioactive materials but exposed or potentially exposed to radiation (such as, janitorial, maintenance, clerical, administrative and technical personnel) will receive initial documented training appropriate to the assignment and exposure potential.

All these personnel are familiarized with the radioisotope symbol and furthermore are told not to touch anything in the labs that they have no reason to, especially containers or equipment displaying the radioisotope symbol. These instructions are given to them in their orientations when hired.

SPECIAL ADDITIONAL TRAINING

Principle Investigators are required to submit a background information form to ensure they have sufficient training and experience to meet their responsibility for radioisotopes ordered, used and disposed under their direction. The Radiation Safety Committee reviews the form and may, at its discretion, require additional training or guidance by another experienced user.

Research management, in assigning research projects and lab facilities, approves the qualifications and technical competence of professionals using or working in the vicinity of radioisotopes.

Assessment of Comprehension

An assessment of comprehension and abilities of radiation and ancillary workers will be conducted during the annual management audit of lab areas. The audit team will conduct random interviews with radiation workers and support staff. The RSO or Radiation Safety Committee will address any issues raised during this or other audits.

The Radiation Safety Committee may use input from the annual management audits, the RSO, radiation workers and support personnel to evaluate training program effectiveness. An existing program may be modified or replaced when the Committee determines that the change proposed will provide the same or better protection than the existing program. The determination may rely on interviews, observation or testing of a test group.

Additional Forms of Communication with Radiation Workers

In addition to the refresher training for various groups of employees, our electronic mail is an effective tool for quickly disseminating information. All employees are tied into the electronic mail system or have access to the corresponding information on paper. Using specific distribution lists, various groups can be targeted. The Radiation Safety Committee uses this method to reinforce certain aspects of the radiation safety program, to let others know of incidents, or to pass along information on regulatory or program changes.

Training Records

Training records will include a course outline, the duration of the course, instructor name(s), date and list of participants. The Radiation Safety Officer or other qualified personnel will provide the training. Reputable instructors knowledgeable in their area of expertise may be brought on site to perform some training. In some instances participants will be sent to various offsite training courses offered by reputable instructors. The Radiation Safety Officer will determine if the instructors and courses of off-site training are appropriate.

Item No. 9: Facilities and Equipment

FACILITY

The DuPont Stine-Haskell Research Center is located on Route 2, (1090 Elkton Road) in Newark, Delaware. The combined facility has over 800 employees located in over 30 buildings. A fence surrounds the 535-acres and access through the gates is controlled on a 24-hour basis by electronic card access and/or security force.

[Field studies at Stine Farm, 1090 Elkton Rd, Newark, DE 19711, will occur only through NRC license # 07-13441-02, Reference Number 030-20681, assigned to the DuPont Stine-Haskell Research Center.]

The DuPont Pharmaceuticals Company, a wholly owned subsidiary of DuPont, also operates within the Stine-Haskell Research Center and uses and stores byproduct material under a separate NRC license, # 07-00455-40. Of the approximately 30 buildings at the Stine-Haskell Research Center, the DuPont Pharmaceutical Company uses unsealed byproduct material in the following buildings: S110, S112, S115, S320, H1, and H14. Bristol-Myers Squibb Company intends purchasing the DuPont Pharmaceutical Company from DuPont. Under this agreement, Bristol-Myers Squibb will lease space at the Stine-Haskell Research Center and make use of the services provided by DuPont to its resident Business Units.

The Radiation Safety Office will maintain a listing of the areas operating under the restricted area definition of 10 CFR 20.1003. The facility may expand or reduce the scope of these areas as long as the change is consistent with one of the criteria described below.

- Criteria used to demonstrate the entire site is contained within a restricted area as defined in 10 CFR 20.1003:
 - a. Personnel provided a pass to enter the site unescorted are informed of the potential hazards from radioactive materials and how to recognize and avoid unreasonable radiation exposure potential. Information will be provided initially. Visitors may also be protected from the potential hazards through use of an escort or by remaining with a vehicle while on site.

- Criteria used to demonstrate an entire building is contained within a restricted area as defined in 10 CFR 20.1003:
 - a. Personnel provided a pass to enter the building unescorted are informed of the potential hazards from radioactive materials and how to recognize and avoid unreasonable radiation exposure potential. Information will be provided initially. Visitors may also be protected from the potential hazards through use of an escort.
- Criteria used to demonstrate a room serves as a restricted area as defined in 10 CFR 20.1003:
 - a. Personnel provided a pass to enter the room unescorted are informed of the potential hazards from radioactive materials and how to recognize and avoid unreasonable radiation exposure potential. Information will be provided initially. Visitors may also be protected from the potential hazards through use of an escort.
- Outside a 10 CFR 20.1003 restricted area, licensed material will be:
 - a. Secured when in storage.
 - b. Attended or secured while in use.
 - c. Confined to rooms posted with the standard radioactive material caution signs as well as a "Authorized Personnel Only" sign.

LABORATORIES

Most of the radiotracer work is at low activity and is carried out in standard laboratories equipped with a chemical fume hood or a biological safety cabinet.

Area Classification

The Radiation Safety Committee's ALARA program uses radioisotopes and total inventory to classify labs containing unsealed material.

- ALARA Category 1 labs - limited to exempt quantities (10 CFR 30.18) provided in Part 30 Schedule B; 10 CFR 20 Appendix C is used for P-33.
- ALARA Category 2 labs - limited to 40 X the Annual Limit of Intake (ALI as defined in 10 CFR 20 Appendix B). The Sum of the Ratios Rule applies where more than one radioisotope is used. Keeping a room's inventory below 40 ALI makes an internal exposure above 1% ALI very unlikely.

Radiation Safety Committee may grant possession levels above 40 ALI to ALARA Category 2 labs. The researcher must provide an evaluation of the contamination and exposure potential and the engineering and administrative controls developed to prevent an intake above 1% ALI (corresponding to 50 mR/year).

Some factors considered by the Radiation Safety Committee:

1. Engineering controls installed
 2. Type of material stored and handled
 3. Radioisotope
 4. Manipulation conducted
 5. Activity per manipulation
 6. Number of manipulations per day or week
 7. Personnel protective equipment used
 8. Contamination control and detection practices in place
- ALARA Category 3 labs - The researcher must provide the Radiation Safety Committee an evaluation of the contamination and exposure potential and the engineering and administrative controls developed to prevent an intake above 10% ALI (corresponding to 500 mR/year).

Eating and Smoking Areas

Eating and smoking is allowed when radioactive materials are in special form, i.e., sealed sources. Radiation Safety Committee review is required for labs using or storing unsealed radioactive material. Review involves the approval signature from one member of the Radiation Safety Committee. RSO signature will be used to confirm:

1. Unsealed radioactive materials in use or storage are limited to exempt quantities as defined by 10 CFR 30 Schedule B, or 10 CFR 20 Appendix C values for radionuclides not listed in 10 CFR 30 Schedule B.
2. Eating and smoking areas are distinct, clearly defined, marked with yellow tape and labeled "Food - No Chemicals".
3. Unsealed radioactive materials, as well as other chemicals, will not be stored or handled in these designated areas.
4. Gloves for radioactive material handling must be removed before entering and/or touching anything within in the designated "Food - No Chemicals" area.
5. Labs wishing to establish eating/smoking areas provide initial wipe test results to the Radiation Safety Office.

Special Use Facilities

A hot-C laboratory (S120) will be used to store radiolabeled materials for distribution to P.I.'s on site.

Prior to authorizing a laboratory for labeling by tritium gas, the Radiation Safety Committee evaluates engineering controls in place for containment of radioactivity and effluent release to restricted and unrestricted areas, per 10 CFR 20 Appendix B values.

Prior to authorizing a facility involving loose material generating alpha particles, the Radiation Safety Committee evaluates engineering and administrative controls for preventing and controlling contamination.

Laboratory Animal

Laboratory animals exposed to radioisotopes are kept separate from those not exposed. All liquid and solid waste is monitored for the presence of radioactivity and, as appropriate, collected and disposed of as radioactive waste. At the end of the experiment, all bedding is removed, the area is cleaned and wipe tested for contamination. Animals in which radioactive materials are used are under the direct control of the principal investigator. All individuals working with the animals, wastes or carcasses contaminated with radioactivity are required to participate in appropriate orientation/training courses.

Experimental animals administered radioactive materials will not be used for human consumption.

Storage Areas

Storage areas are provided for radioisotopes not in active use, for unused portions of radioactive materials, and for wastes that are retained for decay before disposal or for which special disposal arrangements must be made. Storage areas or the containers are secured when unattended.

Facilities holding radioactive waste for decay-in-storage (H-11) are reviewed for the following:

- a. physical access of area limited to authorized personnel
- b. provisions for secondary containment of liquid waste
- c. container protection from the elements
- d. segregation and placement of the waste for ready identification and auditing of waste prior to disposal
- e. fire protection through the use of one or more of the following: non-combustible material of construction, fire suppression equipment such as automatic sprinklers, fire detection and alarm system
- f. ambient radiation levels kept below 2 millirems/hr through administrative controls (activity limits), distance considerations, and/or appropriate shielding

Item No. 10: Radiation Safety Program

PROGRAM AUDITS

A program review is conducted annually by the Radiation Safety Committee. This review is structured to assess compliance with the terms and conditions of the license, and examines the administration and organization of the Radiation Safety Program. This review provides an evaluation of the performance of the RSO and radiation safety staff.

Annually the Radiation Safety Committee conducts interactive laboratory audits. These audits are structured to assess compliance and the development needs of material users. The audit teams include an RSO and a management representative of the user community. Results of the audit are shared with the management of the user community.

Semiannually the RSO and staff conduct announced or unannounced audits of areas that use radioactive materials. The annual Radiation Safety Committee audit attended by the RSO may be used as one of those audits.

Labs handling unsealed radioactive material conduct self-audits at least quarterly. A self-audit checklist is completed and action items are identified.

INSTRUMENTS

Selection Criteria

Radiation monitoring instrumentation selection is based on the radioisotope used, the quantities handled and the minimum detection levels at issue. The table below summarizes some information used in selecting the appropriate instrument.

TABLE 10-1 INSTRUMENT CRITERIA

Surface Contamination and/or Qualitative Exposure Rate			
Radioisotope	Radiation	Probe & Survey Efficiency	Issue
C-14, P-33, S-35	Medium energy beta	Pancake G-M Probe: ~5% C-14 or S-35; ~20% P-33	Contamination
P-32	High energy beta	Pancake G-M Probe: ~35% efficiency	Contamination, external exposure
I-125	Low energy x-ray	Thin NaI Scintillation Probe: ~35% efficiency; Pancake G-M Probe: ~0.5% efficiency	Contamination, external exposure
Cs-137	Medium energy gamma rays	Pancake G-M Probe: ~3,300 cpm/mR/hour	External exposure

TABLE 10-2 LIQUID SCINTILLATION COUNTER CRITERIA

Liquid Scintillation Counter			
Detector	Radiation	Efficiency	Issue
H-3, C-14, P-32, P-33	beta	Setting, energy and quench dependent. Standards used. Typical counting efficiencies: H-3: 50%; C-14, S-35, P-33: 85%; P-32: 95%	Removable contamination
I-125	x-ray	Setting, energy and quench dependent. Standards used. Typical counting efficiencies: I-125: 65%	Removable contamination

Instrument Calibration

Radiation survey meters such as Geiger-Mueller ratemeters and ionization chamber exposure rate meters used by the Radiation Safety Officer or designate will be calibrated annually. Vendors or persons authorized by the NRC or Agreement States to calibrate survey meters, e.g., Applied Health Physics, Inc. (NRC License No. 37-09-135-01), or the University of Delaware (NRC License No. 07-01579-19) will calibrate them. Meters without a current calibration sticker will not be used.

Geiger-Mueller type survey meters used to identify contamination in labs will be checked periodically for operability and ability to detect low level contamination, rather than receiving full calibration. The lab occupant checks such survey meters quarterly or prior to use. Stickers will be used to indicate the date of the last full calibration.

Quarterly operational checks are documented on the Self-Audit Checklist completed and retained by each lab using or storing unsealed radioactive materials. Survey meter checks and calibration stickers reviewed during annual Radiation Safety Committee audits.

The thyroid monitoring system contains a scalar ratemeter equipped with a scintillation probe. It will be calibrated with a NBS traceable iodine-129 standard when iodine-125 is used and a NBS traceable barium-133 if iodine-131 is used.

Liquid scintillation counters are serviced and calibrated by the vendor. Internal standards are used to test the counting efficiency for hydrogen-3 and carbon-14 urine samples.

MATERIAL RECEIPT AND ACCOUNTABILITY

Control of Procurement and Use of Byproduct Material

During normal working hours, radioactive packages are delivered to Site Receiving, S102, attention Radiation Safety Office. During off-duty hours, Site Security accepts delivery of radioactive packages and places them in the designated secured storage area. The RSO is contacted immediately and the carrier asked to remain when a package appears damaged.

Trained receiving personnel deliver the package after the following steps:

- Package does not appear damaged or contaminated
- Packages placarded as DOT White I, Yellow II or Yellow III are wipe tested

The RSO approves requests for radioactive material to enter or leave the facility. This process ensures requested materials, quantities, manufacturer and model are authorized by the license and that possession limits are not exceeded.

Researchers wishing to use licensed material must receive initial training in procurement, safety and waste disposal procedures. The Radiation Safety Office maintains records of this initial training. Procurement, control and disposal requirements are part of the refresher training provided at least biennially.

Before an order is placed for radioactive material, purchase orders and radioisotope request forms are routed to the RSO. The approval of the Radiation Safety Committee is obtained, if required.

Material Control, Accounting and Security

An inventory of all radioisotopes received shall be kept by the RSO and updated quarterly. In addition, inventory sheets are sent to users periodically for updating. The updated inventory sheets are used to further refine the inventory records. All transfer of radioisotopes within the facility must be to approved users only.

Transfer of radioactive material requires the approval of the RSO or designate when radioactive material is transferred to a location not covered under this license.

The following conditions from our existing license are retained:

1. Allow use and transfer of soil, plant and animal tissues with radioactivity of less than the DOT radioactive material definition of 4400 dpm/gram and less than one tenth the NRC exempt quantity limit for the specific radionuclide, e.g., 10 microcuries for carbon-14, without approval of an RSO.

Users document shipment dates, quantities and concentrations. The process of updating periodic radioisotope inventory and the radioactive waste disposal procedure apply to owners of such material. Any lab where the quantities of material in possession exceed one tenth of the NRC exempt quantity shall be considered a radioisotope lab subject to all conditions of the license, e.g., posting, wipe-testing, authorized users, etc.

2. Allow use and transfer of material containing less than the DOT radioactive material definition of 4400 dpm/gm, the NRC source material concentration definition (0.05% or 500 ppm) and one tenth of the NRC exempt limit for natural uranium or thorium (10 microcuries), without approval of an RSO.

OCCUPATIONAL DOSE

External Exposure

Whole body badges are worn by all persons who might receive an external radiation dose in any calendar year in excess of 10% of applicable limits of whole body radiation specified in 10 CFR 20.1201. All individuals who might receive a dose to the extremities in excess of 10% of the standard specified in 10 CFR 20.1201 for hands, forearms, feet and ankles, wear extremity badges. In general, dosimetry is issued when there is any question that a person could approach the annual dose requiring dosimetry.

DuPont will provide film, TLD or OSL (optically stimulated luminescence) badges through a supplier of external dosimetry services that is NVLAP certified in beta and gamma dosimetry and is licensed by the NRC or an Agreement State to provide this service. The minimum exchange frequency is monthly for film, and quarterly for TLD and OSL.

The current dosimeter supplier is Landauer Inc., Technical Department, 2 Science Rd, Glenwood, IL 60425-1586.

The threshold for evaluating the need for dosimetry is P-32 use in excess of 1 millicurie, or I-125 use in excess of 100 microcurie. Other radioisotopes will be evaluated by the Radiation Safety Committee, on a case by case basis, taking into account the quantities of material in use, energy of the radioisotope, shielding, distance and time of exposure.

Internal Exposure

1. Urine samples will be collected for all persons working with more than 40 ALI (Annual Limit Intake, 10 CFR 20 Appendix B) per day or 200 ALI per week if experiments are conducted every seven days or less often. Samples will be counted in a scintillation counter and results communicated to the employee.

Bioassays for tritium will be conducted in accordance with the guidance in ANSU Standard HPS N13.14-1994, "Internal Dosimetry Programs for Tritium Exposure - Minimum Requirements." Approved as an American National Standard on April 13, 1994. Superseding Standards and other bioassay programs accepted by the NRC may also be used.

2. Thyroid measurements for all personnel who work with volatile radioactive iodine in excess of 100 uCi will be made. A low energy gamma scintillation probe system will be used for the thyroid measurements.

When the thyroid burden measurement exceeds 0.12 uCi of I-125 or 0.04 uCi of I-131 or when the average urinary tritium concentration exceeds 5 uCi/l an investigation will be carried out. It will determine the cause(s) of exposure and any reasonable corrective action will be taken to lower the potential for future exposure. Further work status of employees will be restricted if the thyroid burden exceeds 0.5 uCi of I-125 or 0.14 uCi of I-131 and if the urinary tritium meets or exceeds 50 uCi/l.

A body burden of 0.02 ALI will be the investigational level for other radioisotopes.

Air Monitoring

Air monitoring will be conducted by the Radiation Safety Officer or designate whenever volatile iodine may be created during a labeling experiment involving I-125 and:

- a. the iodination is by a new user
- b. a new procedure is used that involves more than 100 uCi, or
- c. a procedure involves greater than 1 mCi.

Results will be compared with the requirements of 10 CFR 20.1302, for compliance.

Air monitoring will be conducted during tritium labeling experiments involving more than 40 ALI per day $[(10E+4 \text{ ALI}) \div 250 \text{ days}]$, or 200 ALI per week if experiments are conducted every seven days or less frequent. Results will be compared with the requirements of 10 CFR 20.1302.

SAFE USE OF RADIONUCLIDES AND EMERGENCY PROCEDURES

General Rules Applicable to Licensed Material not in Sealed Form

The Radiation Safety Committee established the following rules for the use and storage of radioactive materials not in sealed form. As part of its ALARA program the RSC may update the rules after obtaining input from the RSO, the research community and findings from audits or incident investigations.

1. Non-permeable gloves shall be worn when handling radioisotopes. Other personal protection, such as laboratory coats, aprons, safety glasses with side shields, etc. may also be needed, as required by specific work procedures. Laboratory coats shall be worn when using amounts in excess of 1 mCi (10 mCi for H-3; 0.1 mCi for P-32 and I-125). Avoid wearing lab coats outside lab areas. Disposable Tyvek® laboratory coats are recommended to reduce potential contamination.
2. Hands should be washed frequently, especially before eating or smoking, and at the end of each work period.
3. Do not use personal non-disposable items such as pocketknives, handkerchiefs, etc., in connection with radioisotope work.
4. Where operations involving radioactive material have a spill potential, place equipment containing radioactive material in trays lined with plastic or absorbent paper and labeled with the radiation symbol. Low-level analytical and biological operations are exempted.

5. Where appropriate, run reactions in a fume hood with a face velocity between 60 and 80 linear feet per minute. The hood must be labeled with the radioactive material sign. Biosafety cabinets venting internally are not appropriate for radioisotope work.
6. Eating, drinking and smoking are prohibited in labs where unsealed radioisotopes are used or stored, unless specifically authorized by the Radiation Safety Committee.
7. An inventory of radioisotopes on hand is part of the record keeping required by the NRC. On a quarterly basis Principal Investigators (P.I.) will be sent an inventory sheet listing the isotopes in their possession. It is the responsibility of the Principal Investigator to promptly update and return the "Inventory Verification Form" to the Radiation Safety Office.
8. At the area entrances post the "Maximum Expected Quantity" (MEQ) of each radioisotope used or stored.
9. Every ALARA Category 1 lab that used radioactivity during the quarter must conduct a quarterly contamination survey and complete the self-audit checklist. Every ALARA Category 2 or 3 lab that used radioactivity during the prior month must conduct a monthly contamination survey. The contamination survey includes a self-audit checklist. Notation, date and signature accepted in lieu of wipe test if unsealed material not used. If more than 0.2 mCi (2 mCi for H-3) is used at any one time, weekly contamination surveys are required. Lab users will keep records of their surveys and self-audits. If the removable contamination exceeds 200 dpm/100 cm², decontaminate the area. If the removable contamination exceeds 2,200 dpm/100 cm², contact the Radiation Safety Officer who will direct decontamination and record the incident.
10. Every two years users and Principal Investigators of radioisotopes shall attend radiation safety training that includes a review of program requirements. Non-users in the area will receive initial radiation safety awareness level training. Training documentation shall be maintained by the Business Unit or RSO.
11. When leaving or transferred to another location users must complete an exist checklist. Submit a copy to the Radiation Safety Office. All radioactive materials possessed or in transit must be transferred to a listed Principal Investigator or disposed by permitted methods.
12. Documentation of the lack of radioactive contamination is required to release for general use equipment or areas that used unsealed radioactive materials. This is accomplished through the Decommissioning Checklist available from the Radiation Safety Office.

13. Dispose of radioactive waste only in designated, labeled and properly shielded receptacles.

14. Confine radioactive solutions in clearly labeled containers.

15. Protect house services (vacuum, ventilation, etc.) from potential contamination.

Evaluate need for filtering, trapping, or dedicated systems. As a minimum use double traps and an in-line filter before the house vacuum when aspirating liquids containing radioactive materials.

Include tubing or vacuum nozzle on wipe test to document vacuum system is free of contamination; alternatively, use a separate vacuum pump.

16. Radioactive materials used outside an "NRC restricted area" will be:

- secured when in storage. Waste is considered in storage at the end of the day's accumulation, irrespective of the operations planned for the next day.
- attended or secured at all times while in use. Waste being accumulated during the day, prior to storage, falls under the definition of "material in use".
- confined to rooms posted with "Authorized Personnel Only" sign, in addition to the standard radioisotope lab signs.

17. Prior to conducting preparative chemical reactions with radioactive materials, trial runs with non-radioactive material shall be made to check techniques and equipment.

18. No mouth pipetting.

**TABLE 10-3 EXPECTED USE CRITERIA
By Radioisotope and Quantity**

<u>Radionuclide</u>	<u>Shielding</u>	<u>* Lab Coat</u>	<u>Dosimetry Badge</u>	<u>Survey Meter During Use</u>	<u>Air Monitoring or Bioassay</u>	<u># Work Area Secondary Containment</u>	<u>+ End of Week Wipe Test</u>
C-14	N/A	1 mCi	N/A	N/A	10 mCi	10 mCi	0.2 mCi
H-3	N/A	10 mCi	N/A	N/A	100 mCi	100 mCi	2 mCi
P-32	0.1 mCi	0.1 mCi	1 mCi	1 mCi	10 mCi	10 mCi	0.2 mCi
P-33	N/A	1 mCi	N/A	N/A	10 mCi	10 mCi	0.2 mCi
S-35	N/A	1 mCi	N/A	N/A	10 mCi	10 mCi	0.2 mCi
I-125	0.01 mCi	0.1 mCi	0.1 mCi	0.1 mCi	1 mCi	1 mCi	0.2 mCi

* Lab coats (Tyvek®) recommended but not required when handling smaller quantities.
Note: Disposable gloves required with any quantity of unsealed material.

Tray or equivalent required when these quantities are handled.
Note: Plastic-backed absorbent paper required with any quantity of unsealed material.

+ Monthly wipe tests required for any quantity of unsealed material used in ALARA Category 2 or 3 lab. A monthly notation, date and signature accepted if unsealed material not used within the last month. Quarterly wipe test required for any quantity of unsealed material used in ALARA Category 1 lab.
After using radioactive material a sweep with a survey meter is recommended of the work area, adjacent floor, door handle, lab coat and bottom of the shoes. A pancake-G-M probe is appropriate for C-14, S-35, P-32 and P-33; a scintillation probe is appropriate for I-125.

@ Self-audit checklist completed even when radioactive materials are not used or stored in the room; quarterly for ALARA Category 1 labs and monthly for ALARA Category 2 or 3 labs.

General Rules Applicable to Licensed Material as a Sealed Source

1. The Principal Investigator/Custodian of a sealed source is responsible for notifying the RSO of any proposed changes in the location or status of a sealed source. The Radiation Safety Office must be contacted before making arrangements to relocate or transfer ownership of a sealed source.
2. A label must be attached to the source holder, stating the type and quantity of radioactive material and the date of manufacture. The label must bear the conventional radiation symbol. In addition, the area needs to be posted. The drawer or other container where a sealed source may be stored shall also be labeled.
3. Radioactive materials used as sealed sources must be in sealed containers of a design approved by the NRC or an Agreement State.
4. Adequate shielding must be provided at all locations where radiation sources are used or stored. Make sure the radiation intensity at all points accessible to personnel is within limits specified in 10 CFR 20.1201 and 10 CFR 20.1301. Contact the RSO if radiation levels could approach 2 millirems/hour. Keep exposures ALARA.
5. All operations involving transfer of sealed sources for nuclear gauges must be performed under the direct supervision of the RSO or approved alternate. During transfer of these sources between locations, remote handling apparatus and special shielding containers must be employed to ensure that exposure to personnel working with the material is kept to a minimum. All personnel not directly required for such transfer must be cleared from the area and the restricted area requirements implemented.
6. A Process Hazards Review and Radiation Safety Committee approval are required when personnel are likely to receive a dose in excess of 20 millirems/week or enter a radiation field greater than 2 millirems/hr.
7. Each area in which radioactive sources are used or stored must be conspicuously posted with the radioisotope sign and the appropriate wording given in 10 CFR 20.1901. Contact the Radiation Safety Office for the necessary signs.
8. Each area in which radioactive sources are used or stored must be periodically surveyed to ensure that no dangerous levels of radiation exist and radiation exposure is As Low As Reasonably Achievable (ALARA).

9. To minimize damage to sources in case of fire, each installed source must be in an area protected by automatic sprinklers. Exceptions must be approved by the RSO, who will consult with the Fire Chief.
10. The source owner must annually complete an annual Self-Audit Checklist for each sealed source so that the source owner maintains compliance and awareness. The form shall be retained three years by the source custodian.

Millicurie Quantities of Phosphorous-32

The following special safety instructions will be provided to individuals using millicurie quantities of phosphorous-32:

- a. Take special precautions when handling quantities of P-32 in excess of 1 mCi; prevent ingestion and excessive exposure of skin or eyes to the strong beta-radiation. Keep exposure as low as reasonably achievable (ALARA).
- b. Every reasonable attempt shall be made to prevent unnecessary exposure. Use suitable plastic shielding that absorb beta particles and prevent generation of secondary x-rays.
- c. A "dry run" shall be required before performance of an unfamiliar procedure using millicurie quantities of P-32.
- d. A portable monitor with a thin window GM probe shall be used to survey work areas during and at the conclusion of each procedure.
- e. All portable equipment must be monitored with a GM counter for contamination before being removed from the controlled area.
- f. Shoes, lab coats and hands must be monitored before leaving the area.
- g. Wipe tests will be performed and documented at the completion of the experiment.
- h. Body and extremity (ring or wrist) badges shall be worn.
- i. Levels of radiation shall not exceed 0.75 mR/hr. on the average except for brief periods during experiments when exposure to users shall be kept ALARA and below 100 mrem/week.
- j. All rules in the Radiation Safety Procedure shall also apply.

EMERGENCY PROCEDURES

Incident Response Principles

In the Event of a Radiation Incident the RSO or designate will take appropriate action in one or more of the following ways:

- 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.
- Suspend operations in a laboratory area and/or suspend work of an individual.
- Schedule and supervise appropriate decontamination procedures.
- Require an Incident Investigation

Minor Spills - not exceeding the more stringent of 1 mCi and 10 x exempt quantities (10 CFR 20 Appendix C - Quantities Requiring Labeling)

- **NOTIFY:** Notify persons in the area that a spill has occurred.
- **EVALUATE:** Determine extent of spill, exposure potential and clean up capabilities. (If assistance required contact RSO through Site Emergency number.)
- **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 line management and to the Radiation Safety Officer or designate.

Major Spills - exceeding the more stringent of 1 mCi and 10 x exempt quantities (10 CFR 20 Appendix C - Quantities Requiring Labeling)

- **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 significant radiation exposure.
- **ISOLATE THE AREA:** Barricade the area and restrict access.
- **REPORT:** Use Site Emergency Number and request immediate Radiation Safety Officer response. The Response Team will be contacted, if appropriate.
- **PERSONNEL DECONTAMINATION:** Contaminated clothing should be removed and stored for further evaluation by the Radiation Safety Officer. If the spill is on the skin, flush thoroughly and then wash with mild soap and lukewarm water.
- **INVESTIGATE:** Convene an Incident Investigation.

Survey of Areas Handling Unsealed Material

Laboratories where radioisotope work is conducted are wipe-tested two times per year by the RSO or designate. Individual users are required to perform wipe tests or monitoring at least quarterly, per Table 10-3 Expected Use Criteria.

Corrective Action level for decontamination shall be 200 dpm/100cm². The action level for wipe test results requiring immediate contact of a Radiation Safety Officer and incident documentation is 2,200 dpm/100cm² (equivalent to 0.005 microcurie, the action level used with sealed source leak tests.). Incidents below the 2,200 dpm/100cm² action level would be documented in the monthly wipe test records kept in the labs by radioisotope users.

Sealed Sources

A leak test is conducted every six months, unless:

1. the source contains 100 uCi or less of beta and/or gamma emitting material, or 10 uCi or less of alpha emitting material
2. the source material consists entirely of a gas, contains only tritium or has a physical half life under 30 days

3. the source is generally licensed by the vendor and a longer leak test interval is specified
4. The source or detector cell is in storage. When the source or detector cell is removed from storage for use or transfer to another person, it shall be tested if a leak has not been conducted within 6 months.

We will implement the model leak test program published in Appendix T of NUREG-1556, Volume 11, "Program-Specific Guidance about Licenses of Broad Scope." Alternately, persons specifically licensed by the Commission or an Agreement State to perform such services will perform the tests.

Sealed sources not requiring leak testing will be physically inventoried every 6 months.

Item No. 11: Waste Management

DISPOSAL BY INCINERATION

Waste that may be incinerated will be shipped to facilities licensed to handle those materials, such as the DuPont Experimental Station or contract commercial facilities.

Radioisotopes will be packaged in compliance with NRC and DOT requirements.

Records of shipment will be kept by the Radiation Safety Officer.

Item No. 11.2: Land Disposal of Radioactive Isotopes

Land disposal of radioisotopes is through a broker and in compliance with 10 CFR 20.2006. Transfer of material to the containers will be done by the Radiation Safety Officer or designate. The person handling the waste will wear, as a minimum, disposable gloves and lab coat or equivalent. The transfer of material will be done in such a manner as to ensure no skin contact. A personal monitoring device will be worn if needed and an appropriate survey meter will be present.

Radioisotopes will be packaged in compliance with NRC, DOT and the broker's instructions. We will use the current procedures supplied by the broker.

Records of shipments will be kept by the Radiation Safety Officer.

Item No. 11.3: Release Into the Air or Water

Release into the air or water will be made in concentrations in conformance with 10 CFR 20.1302.

Disposal by release into the sanitary sewer will be made in accordance with 10 CFR 20.2003.

Discharge of licensed material into the sanitary sewer will be limited to readily soluble (or readily dispersible biological material). Records will be maintained of all disposals made into the sanitary sewage system. Prior release into the sanitary sewer, a Standard Operating Procedure will be developed to address the calculations and limitations specified in 10 CFR 20.2003(a)(2)(3)(4) and the records necessary to demonstrate compliance. If one of the methods described in NRC Information Notice 94-07 is not to be used to test representative sample of waste streams for sewer disposal, NRC Region I will be provided a description of the alternative methodology including appropriate models, calculations, analytical techniques and quality control measurements as well as the records that will be maintained.

All wastes are segregated and disposed of by or under the direct supervision of the Radiation Safety Officer or designate. Waste loads approaching the calculated quantity necessary to release the daily portion of the ALARA target (currently 10% of 10 CFR 20 Appendix B values for unrestricted release, air) will be investigated, and if practical, analyzed prior to incineration.

Item No. 11.4: Decay-In-Storage (H-11)

Radioactive waste with a physical half-life of less than or equal to 120 days will be held for decay-in-storage and then disposed in ordinary trash. See Site Radiation Safety Procedure (Item A of renewal application) for instructions provided to users on waste handling. All radioactive waste containers are labeled with information on the radioisotope, initial activity and date of packaging. Procedures for disposal by decay-in-storage are maintained by the Radiation Safety Office and are revised as necessary.

1. Verify survey meter equipped with an end window or "pancake" Geiger-Mueller probe, or other appropriate probe is operating correctly and has been calibrated within the last 6 months. On survey form, record name of person conducting survey, survey date, meter used and meter calibration date.
2. Set survey meter to its most sensitive setting. Establish background reading outside the storage facility. In millirem/hour, record background reading on survey form.
3. Review and record containers by radionuclide. Verify containers have been held at least 10 half lives, e.g., S-35: 874 days; P-32: 143 days, P-33: 250 days; I-125: 596 days; Cr-51: 277 days. Consult RSO or designate for physical half-life (up to 120 days) for radionuclides not listed. Record initial storage date, initial activity (uCi) and unique container ID on survey form.
4. With no interposed shielding and the survey meter set at its most sensitive setting, take readings of container surface. If readings are indistinguishable from background readings, record container survey readings on survey form. If readings are above background, identify and segregate waste container; contact Radiation Safety Officer or designate for resolution.
5. Remove or deface all radioactive material labels from container and waste tags/labels.
6. Provide unique container ID on both survey form and container.
7. Record summary waste information on survey form, e.g., waste type, chlorine or metals present, number of containers, as appropriate.
8. Submit survey form and copy to the RSO or designate. Records retention period: three years.

ITEM NO. 11.5: Disposal Without Regard to Residual Radioactivity

Tritium and carbon-14 waste meeting the criteria listed in 10 CFR 20.2005 may be discarded without regard to its radioactivity.

Consistent with DuPont Experimental Station license amendment 62 (DuPont letter dated July 19, 1996), the following conditions are included in the licence application:

1. Allow use and transfer of soil, plant and animal tissues with radioactivity of less than the DOT radioactive material definition of 4400 dpm/gram and less than one tenth the NRC exempt quantity limit for the specific radionuclide, e.g., 10 microcuries for carbon-14, without approval of an RSO.

User would be required to document shipment dates, quantities and concentrations. The currently used, periodic radioisotope inventory update process and radioactive waste disposal procedure would apply to owners of such material. Any lab where the quantities of material in possession exceed one tenth of the NRC exempt quantity shall be considered a radioisotope lab subject to all conditions of the license, e.g., posting, monthly wipe-testing, authorized users, etc.

2. Allow use and transfer of material containing less than the DOT radioactive material definition of 4400 dpm/gm, the NRC source material concentration definition (0.05% or 500 ppm) and one tenth of the NRC exempt limit for natural uranium or thorium (10 microcuries), without approval of an RSO.

Users would be allowed to use material meeting the criteria above in general use labs (non-rad labs) and would not be subject to license conditions. Users would be required to review the toxicity and prudent practices appropriate for the given compounds in their possession, during their annual Hazard Communication (Right to Know) training. Waste meeting the criteria would be disposed without regard to radioactivity.

Item No. 11.6: Interim Storage (S130)

Radioactive waste generated on-site will be held for storage at the original location or another nearby DuPont location possessing a Type A license of broad scope: Experimental Station (license 07-0455-02).

The host license conditions will apply to the waste being stored there. After storage the waste may be returned to the originating location or handled according the host license conditions, including arrangements for off-site land disposal.

Item No. 11.7: Radioactive Waste Disposal Procedure

Radioactive waste is created as part of most research and development projects involving radioisotope labeled compounds. It may be regulated by the NRC, the EPA and their state counterparts.

Questions or concerns on the proper handling and disposal of radioactive waste should be directed to your supervisor, a member of the Site Radiation Committee, your business unit Radiation Safety Coordinator or a Radiation Safety Officer (RSO).

Disposal Principles

Disposal of all radioactive materials is coordinated by the RSO or designate.

1. Sewer disposal of radioactive material requires approval from the Radiation Safety Committee.
2. Consult RSO before adding different radioisotopes to the same waste container.
3. Clearly label with the radioactive material symbol, laboratory containers used to accumulate or store radioactive waste.
5. To the extent possible, avoid generating mixed waste, i.e., waste regulated by EPA (RCRA waste) and NRC (LLRW). Consult with an RSO or Radiation Safety Coordinator.
6. Before ordering radioactive material containing radioisotopes with half-lives greater than 120 days, except H-3, C-14 and S-35, consult an RSO or Radiation Safety Coordinator.
7. Reduce the volume and activity of radioactive waste to the extent possible.
8. Limit the activity per container and use appropriate shielding on the container's exterior to keep radiation levels below 2 millirems per hour and as low as reasonably achievable (ALARA). Lead shielding or containers may not be incinerated.
9. Consult RSO if waste container's activity could exceed 1 mCi S-35.

10. All radioactive waste containing dry, liquid or scintillation vials, must be tagged with a completed Experimental Station Waste Tag. RCRA waste classification procedures apply and any appropriate EPA Hazardous Waste Codes must be added. On the back of this tag, a piece of radioisotope tape must be placed with the isotope activity and data recorded. All tags must also have the generator's name, signature, business unit, location and phone number. Consult an RSO if there are any questions.
11. Before transporting, properly decontaminate waste containing radioactivity and biohazardous material such as blood, blood products, BSL1, BSL2 or BSL3 organisms.

Radioactive Waste Packaging

Dry Waste Handling

- Dry waste consists of paper, plastics and limited quantities of glass and metal. It may contain trace quantities of liquid such as remains in an emptied sample tube.
- It is placed in a plastic lined 1 cubic foot cardboard container or fiber drum. When dry waste container is full, seal the yellow plastic liner with a tie or tape, seal the cardboard container with tape and tag with a completed Stine-Haskell Research Center waste tag.

Liquid Scintillation Vials

- Plastic scintillation vials do not need to be emptied into the liquid waste jug. As long as the case is not larger than 15"x15"x15", they may be put back into the original case and discarded when the case is full. Alternatively, they can be placed in plastic waste jugs and handled as liquid waste.
- Glass scintillation vials are incinerated in limited numbers due to the incinerator's limited glass handling capacity. Plastic vials should be used whenever possible. Place glass scintillation vials in plastic one-gallon jugs for handling as liquid waste.
- Scintillation cocktails containing hazardous chemicals (RCRA regulated) require RSO approval prior to ordering. Mixed waste (regulated by EPA and NRC) creates special challenges and additional disposal costs. Use non-RCRA scintillation cocktails such as Packard UltimaGold whenever possible.
- Consult chemical disposal procedure for classification of any RCRA (EPA regulated) waste.
- Place completed waste tag on box or jug of scintillation vials so tags are on the exterior (outside of bagged jug) and readily visible.

Liquid Waste Handling

- Through process knowledge, evaluate liquid waste for classification under RCRA. Consult chemical waste disposal procedure.

- Place liquid waste in one gallon, wide-mouth, plastic jug, no more than 3/4 full, inside a 4-mil yellow plastic bag (Stores No. 301660) and placed in a plastic pail (secondary container) or equivalent.
- Limit S-35 to 1 mCi in any one container. Sample liquid waste containing S-35 and determine its activity. The results must be listed on the waste tag, in disintegrations per minute (DPM) of the sample and microcuries of the entire container. The scintillation count results should also be retained with the laboratory wipe tests results.

Attachment 1: Financial Assurance Certificate

Page 1 of 4



E. I. du Pont de Nemours and Company
Legal, D-7096-2
1007 Market Street
Wilmington, Delaware 19898

Nancy A. Sandell
Sr. Legal Assistant
(302)774-4406
(302)774-1189 (FAX)
(800)248-5260 (FAX)

March 16, 2001

NORM HENRY
CR&D
STINE (RM 16)

RE: SELF-GUARANTEE

Attached for your files is an updated Self-Guarantee, signed by Gary Pfeiffer, the Chief Financial Officer of the DuPont Company. Please maintain this document at your site.

If you have any questions, please call.

A handwritten signature in cursive script that reads "Nancy A. Sandell".

NANCY A. SANDELL

Attachment

Attachment 1: Financial Assurance Certificate

Page 2 of 4



DuPont Finance

DuPont Finance
Suite 3000 DuPont Bldg.
1007 Market Street
Wilmington, DE 19898
Tel. (302) 774-0561
Fax (302) 774-7869

Gary M. Pfeiffer
Senior Vice President
and
Chief Financial Officer

March 16, 2001

United States Nuclear Regulatory Commission
Region I
476 Allendale Road
King of Prussia, PA 19406-1415

Re: E. I. du Pont de Nemours and Company
Self-Guarantee
Stine-Haskell Research Center - License No. 07-13441-02
Docket No: 030-20681
Control No: 119309

Gentlemen:

I am the chief financial officer of E. I. du Pont de Nemours and Company (DuPont) located at 1007 Market Street, Wilmington, Delaware 19898. This Self-Guarantee is provided by DuPont to the United States Nuclear Regulatory Commission (the "Commission") pursuant to 10 CFR Part 30 Appendix C for License No. 07-13441-02 (Stine Haskell Research Center). Licensee's decommission costs for the Stine Haskell Research Center are estimated at \$10.2 Million.

- A. This guarantee will remain in force unless the licensee sends notice of cancellation by certified mail to the Commission. Cancellation may not occur, however, during the 120 days beginning on the date of receipt of the notice of cancellation by the Commission, as evidenced by the return receipt.
- B. The licensee shall provide alternative financial assurance as specified in the Commission's regulations within 90 days following receipt by the Commission of a notice of cancellation of the guarantee.
- C. The guarantee and financial test provisions must remain in effect until the Commission has terminated the license or until another financial assurance method acceptable to the Commission has been put in effect by the licensee.
- D. The licensee will promptly forward to the Commission and the licensee's independent auditor all reports covering the latest fiscal year filed by the

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Stine-Haskell Research Center, Newark, Delaware
License 07-13441-02 Renewal Application
September, 2001

NONNEGOTIABLE

Attachment 1: Financial Assurance Certificate

Page 3 of 4

licensee with the Securities and Exchange Commission pursuant to the requirements of Section 13 of the Securities and Exchange Act of 1934.

- E. If, at any time, the licensee's most recent bond issuance ceases to be rated in any category of "A" or above by either Standard and Poors or Moodys, the licensee will provide notice in writing of such fact to the Commission within 20 days after publication of the change by the rating service. If the licensee's most recent bond issuance ceases to be rated in any category of A or above by both Standard and Poors and Moodys, the licensee no longer meets the requirements of Section II.A. of this appendix.
- F. The licensee will fund and carry out the required decommissioning activities or, upon issuance of an order by the Commission, the licensee will set up and fund a trust in the amount of the current cost estimates for decommissioning.

This firm is required to file a Form 10K with the Securities and Exchange Commission (SEC) for the latest fiscal year.

The fiscal year of this firm ends on December 31. The figures for the following items marked with an asterisk are derived from this firm's independently audited, year-end financial statements and footnotes for the latest completed fiscal year, ended December 31, 2000. DuPont will repeat passage of the financial test within 90 days after the close of each fiscal year.

FINANCIAL TEST

(In Millions)

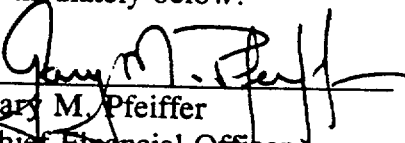
- | | | |
|-----|--|-------------------------|
| 1. | Current decommissioning cost estimates..... | \$10.2 |
| 2. | Current bond rating
and name of rating service..... | AA-
Standard & Poors |
| *3. | Tangible Net Worth..... | \$ 4,934 |
| *4. | Total Assets in the U.S. | \$24,894 |
| 5. | Are total U.S. assets and Tangible Net Worth each at least 10 times the total current decommissioning cost estimate for all decommissioning activities for which E. I. du Pont de Nemours and Company is responsible as self-guaranteeing licensee and as parent-guarantor?..... | Yes |

*Denotes figures derived from audited financial statements

Attachment 1: Financial Assurance Certificate

Page 4 of 4

I hereby certify that the wording of this letter meets the requirements specified in 10 CFR Part 30 Appendix C as such regulations were constituted on the date shown immediately below.



Gary M. Pfeiffer
Chief Financial Officer

March 16, 2001

Resume of Radiation Safety Officer (RSO) TRAINING AND EXPERIENCE

Radiation Safety Committee Chairperson

Mr. Eric A. Benner

Objective: List of training and experience using radioisotopes as a qualification for the position of Chairperson of the Stine-Haskell Radiation Safety Committee.

Education: 1981 BS in Geology from University of Delaware

October 1990 Stuart/Kline Radiation Safety Course. Eight hour Presentation on isotopes and NRC regulations, guidelines

September 1990 Stine-Haskell Radiation Orientation Course

1985 to Present Annual Radiation refresher course

Experience: 1985 to Present - Use of Tritium in a number of biological assays including: saturation assays; displacement assays; kinetic assays; gel separation; and photo affinity labeling.

1985 to 1996 - Use of Sulfur 35 in a number of biological assays such as saturation, kinetic, and displacement.

1990 - A few experiments using I-125

1993 to Present - Served on Radiation Safety Committee and participated in annual lab inspections, annual review of the radiation program, and the quarterly committee meetings.

Attachment 2: Resume of RSO and Radiation Safety Committee Chairperson

Radiation Safety Officer (RSO) Training and Experience

Mr. Norman W. Henry, III, M.S., C.I.H.

Education:

- BA in Chemistry from Lafayette College, Easton, Pennsylvania - 1966
- MS in Animal Science & Biochemistry, University of Delaware, Newark, Delaware - 1977

Training:

- Radioactive Materials Training Course, 1972, Louviers ESD (A.E.C.) - 2 weeks
- 8-Hour Radiation Safety Trng. Seminar at Haskell Laboratory, October 10-11, 1984
- 4-Hour Radiation Hazardous Emergency Response Training Seminar, Stine-Haskell Research Center, April 30, 1991.
- Radiation Update Symposium, March 19&20, 1991
- Radiation Update Symposium, April 28, 1995
- Managing Ionizing Radiation Program for the Industrial Hygienist AIHCE, May 15&16, 1993.
- Selection of Portable Radiation Survey Equipment, PDC, AIHC&I, May 19, 1996
- Handling Naturally Occurring Radioactive Materials (NORM), PDC, AIHCE, May 21, 2000.

Experience:

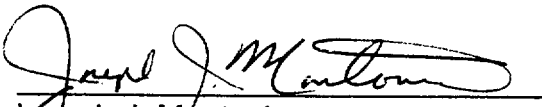
- Haskell Laboratory for Industrial Medicine and Toxicology, 1967-1980, used C-14 in metabolism studies.
- Radiation Committee Chairperson 1977-1990
- Assistant Radiation Safety Officer 1990-1993
- Primary RSO in 1993
- Primary RSO to present, Stine-Haskell Research Center, license DuPont
- Appointed to Delaware Radiation Authority, 1976
- Chairman of Delaware Radiation Authority, 1987
- Industrial Representation on Delaware Radiation Authority 1976-present (2001)
- Appointed to ACURI (Appalachian Compact of Users of Radioisotopes) 1989
- Board Member of ACUCI 1989 - present, Chairman of Technical Advisory Committee
- Health Physical Society Member
- Health Physical Society, RSO Section Member
- Delaware Valley Society for Radiation Safety (DVSRS) member
- A.I.H.A. Ionization Radiation Committee Member, 1993-present

Attachment No. 3

Radiation Safety Officer Delegation of Authority

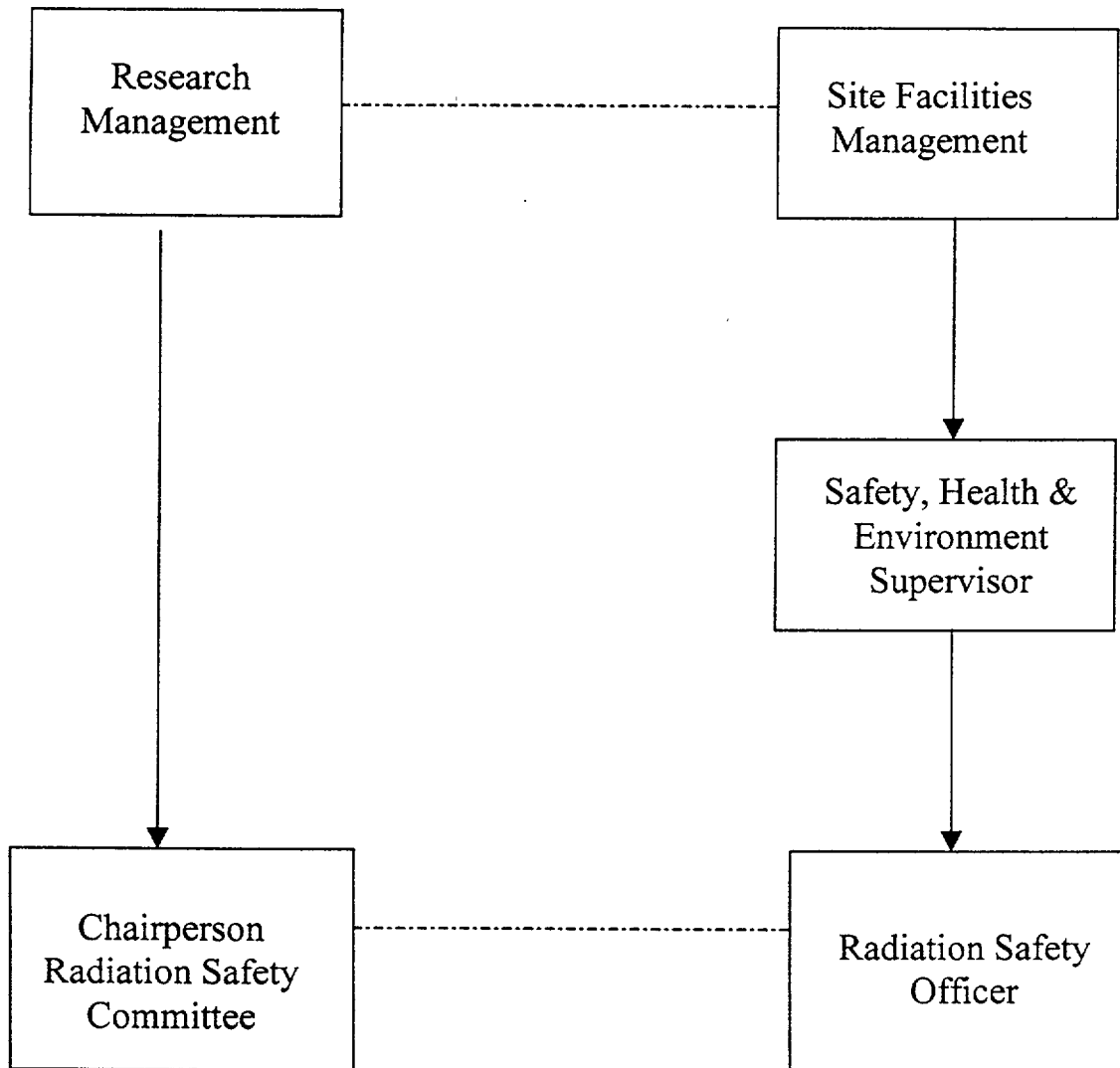
Norman W. Henry, III, has been appointed Radiation Safety Officer and is responsible for ensuring the safe use of byproduct material. The Radiation Safety Officer is responsible for managing the radiation safety program; identifying radiation safety problems; initiating, recommending or providing corrective actions; verifying implementation of corrective actions; and ensuring compliance with regulations for the use of byproduct material.

The Radiation Safety Officer is hereby delegated the authority necessary to meet these responsibilities. The Radiation Safety Officer has the authority to immediately stop any operations involving the use of byproduct material in which health and safety may be compromised or may result in non-compliance with NRC requirements.



Joseph J. Montovino
Manager, Facilities and Operations
Stine Haskell Research Center

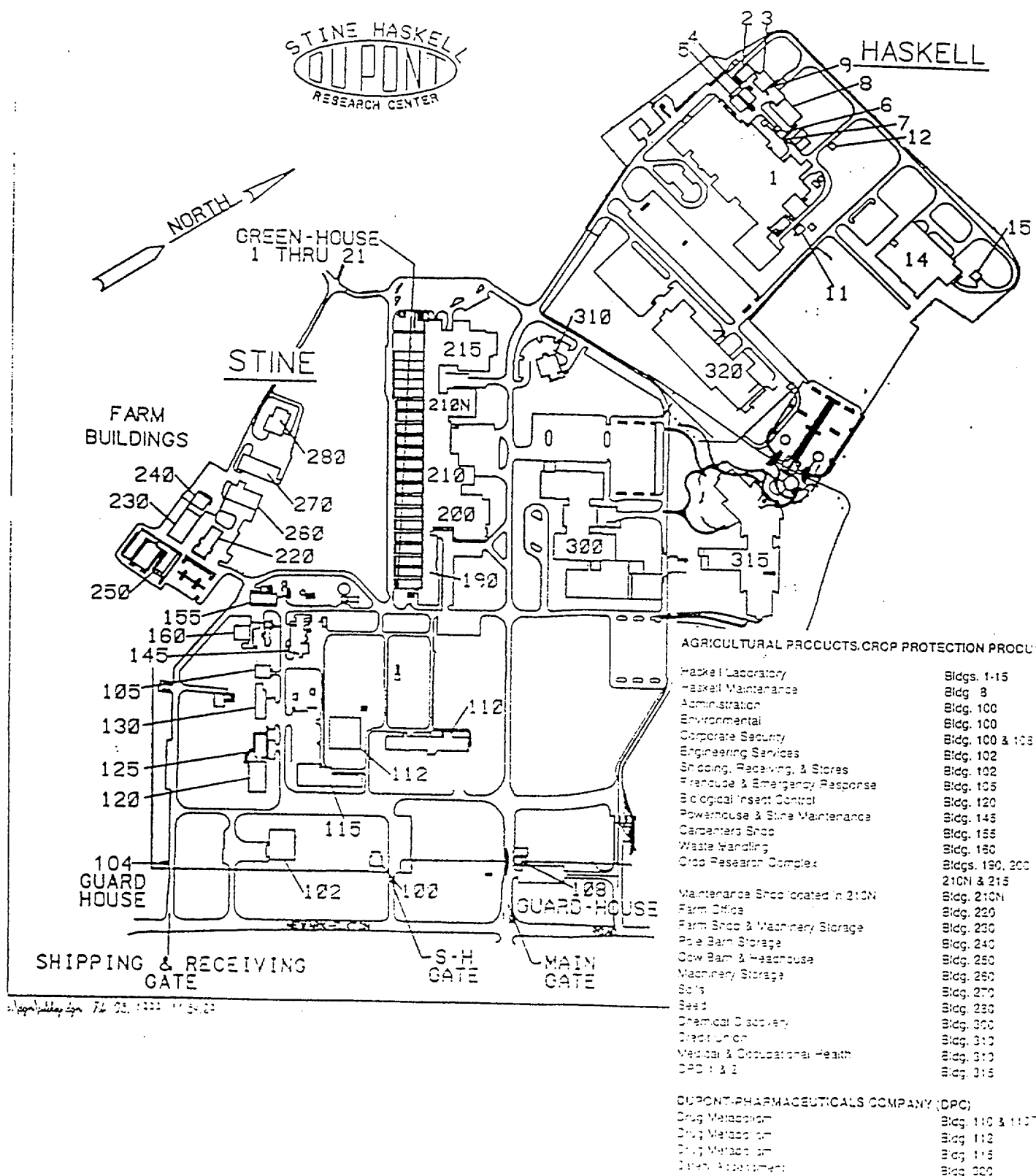
Attachment 4: Organizational Chart



Stine-Haskell Research Center
Radiation Safety Program

Site Facilities Services provides radiation safety resources to the research community.

Attachment 5: Map of the Stine-Haskell Research Center



This is to acknowledge the receipt of your letter/application dated

9/26/2001, and to inform you that the initial processing which includes an administrative review has been performed.

☒ RENEWAL 07-13441-02
There were no administrative omissions. Your application was assigned to a technical reviewer. Please note that the technical review may identify additional omissions or require additional information.

☐ Please provide to this office within 30 days of your receipt of this card

A copy of your action has been forwarded to our License Fee & Accounts Receivable Branch, who will contact you separately if there is a fee issue involved.

Your action has been assigned **Mail Control Number** 1 3 0 3 6 8.
When calling to inquire about this action, please refer to this control number.
You may call us on (610) 337-5398, or 337-5260.

BETWEEN:

License Fee Management Branch, ARM
and
Regional Licensing Sections

: (FOR LFMS USE)
: INFORMATION FROM LTS
: -----
:
:

: Program Code: 03610
: Status Code: 2
: Fee Category: 3L
: Exp. Date: 20011031
: Fee Comments: _____
: Decom Fin Assur Req'd: Y
:
:

LICENSE FEE TRANSMITTAL

A. REGION *I*

1. APPLICATION ATTACHED

Applicant/Licensee: E. I. DU PONT DE NEMOURS & CO., INC
Received Date: 20011001
Docket No: 3020681
Control No.: 130368
License No.: 07-13441-02
Action Type: Renewal

2. FEE ATTACHED

Amount: _____
Check No.: _____

3. COMMENTS

Signed *M. A. Perkins*
Date *10/2/2001*

B. LICENSE FEE MANAGEMENT BRANCH (Check when milestone 03 is entered /__/)

1. Fee Category and Amount: _____

2. Correct Fee Paid. Application may be processed for:

Amendment _____
Renewal _____
License _____

3. OTHER _____

Signed _____
Date _____