

MATERIALS LICENSE

Amendment No. 57

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and Title 10, Code of Federal Regulations, Chapter I, Parts 30, 31, 32, 33, 34, 35, 36, 39, 40, and 70, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee

1. Princeton University
Occupational Health and Safety2. Forrestal Campus
Princeton, New Jersey 08544-0710In accordance with letter dated
July 19, 1995,3. License Number 29-05185-24 is amended in
its entirety to read as follows:

4. Expiration Date June 30, 1996

5. Docket or
Reference No. 030-008826. Byproduct, Source, and/or
Special Nuclear Material7. Chemical and/or Physical
Form8. Maximum Amount that Licensee
May Possess at Any One Time
Under This LicenseA. Any byproduct material
with Atomic Nos. 1
through 83

A. Any

A. Not to exceed 300
millicuries per
radionuclide and 30
curies total

B. Hydrogen 3

B. Any

B. 50 curies

C. Carbon 14

C. Any

C. 1 curie

D. Silicon 31

D. Any

D. 1 curie

E. Phosphorus 32

E. Any

E. 2.5 curies

F. Sulfur 35

F. Any

F. 2.5 curies

G. Argon 37

G. Any

G. 500 millicuries

H. Cobalt 60

H. Any

H. 2.4 curies

I. Iodine 125

I. Any

I. 900 millicuries

J. Cesium 137

J. Any

J. 450 millicuries

K. Cesium 137

K. Sealed sources

K. 600 millicuries

L. Polonium 210

L. Any

L. 50 millicuries

M. Actinium 227

M. Any

M. 6 millicuries

N. Thorium 228

N. Any

N. 100 millicuries

O. Thorium 230

O. Any

O. 100 microcuries

P. Thorium 231

P. Any

P. 100 microcuries

Q. Americium 241

Q. Any

Q. 100 millicuries

R. Americium 241

R. Sealed sources

R. 1 curie

S. Americium 242

S. Any

S. 50 microcuries

T. Americium 243

T. Any

T. 3 microcuries

U. Curium 242-244

U. Any

U. 2 millicuries

V. Curium 248

V. Any

V. 3 microcuries

W. Berkelium 249

W. Any

W. 16.7 millicuries

X. Berkelium 250

X. Any

X. 100 microcuries

Y. Californium 250

Y. Any

Y. 500 microcuries

Z. Californium 252

Z. Any

Z. 10 millicuries

AA. Cesium 137

AA. Sealed sources

AA. See Item 9.AA.; not to
exceed 2 curies total

BB. Cesium 137

BB. Sealed source (ICN
Model 371)

BB. 1 curie

CC. Cesium 137

CC. Sealed source (3M
Type 4FGS Capsule)

CC. 600 millicuries

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**MATERIALS LICENSE
SUPPLEMENTARY SHEET**

License number

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Docket or Reference number

030-00882

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9. Authorized use

- A. through Z. Research and development as defined in 10 CFR 30.4; animal studies.
- AA. For possession and use in Accu Ray, Kay Ray, LFE, Ohmart or Texas Nuclear devices which have been evaluated and approved for licensing purposes and authorized for distribution under a license issued by the U.S. Nuclear Regulatory Commission or an Agreement State.
- BB. Calibration of instruments.
- CC. For use in J.L. Shepherd and Associates, Inc., Model 28-6B calibrator to measure the density of ceramics.

CONDITIONS

10. Licensed material shall be used only at the licensee's facilities at Princeton University Main Campus, Princeton, New Jersey and James Forrestal Campus, Plainsboro, New Jersey.
11. A. Licensed material shall be used by, or under the supervision of, individuals designated by the licensee's Radiation Safety Committee, Malcom S. Steinberg, Chairperson. The licensee shall maintain records of individuals designated as users.
- B. The Radiation Safety Officer for this license is Robert R. Milwicz.
12. A. Sealed sources and detector cells shall be tested for leakage and/or contamination at intervals not to exceed 6 months or at such other intervals as are specified by the certificate of registration referred to in 10 CFR 32.210, not to exceed 3 years.
- B. Notwithstanding Paragraph A of this Condition, sealed sources designed to emit alpha particles shall be tested for leakage and/or contamination at intervals not to exceed 3 months.
- C. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, a sealed source or detector cell received from another person shall not be put into use until tested.
- D. Each sealed source fabricated by the licensee shall be inspected and tested for construction defects, leakage, and contamination prior to any use or transfer as a sealed source.
- E. Sealed sources and detector cells need not be leak tested if:
- (i) they contain only hydrogen 3; or
 - (ii) they contain only a gas; or
 - (iii) the half-life of the isotope is 30 days or less; or

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(12.E. continued)

CONDITIONS

- (iv) they contain not more than 100 microcuries of beta and/or gamma emitting material or not more than 10 microcuries of alpha emitting material; or
 - (v) they are not designed to emit alpha particles, are in storage, and are not being used. However, when they are removed from storage for use or transfer to another person, and have not been tested within the required leak test interval, they shall be tested before use or transfer. No sealed source or detector cell shall be stored for a period of more than 10 years without being tested for leakage and/or contamination.
- F. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. Records of leak test results shall be kept in units of microcuries and shall be maintained for inspection by the Commission. If the test reveals the presence of 0.005 microcurie or more of removable contamination, a report shall be filed with the U.S. Nuclear Regulatory Commission and the source shall be removed from service and decontaminated, repaired, or disposed of in accordance with Commission regulations. The report shall be filed within 5 days of the date the leak test result is known with the U.S. Nuclear Regulatory Commission, Region I, ATTN: Chief, Nuclear Materials Safety Branch, 475 Allendale Road, King of Prussia, Pennsylvania 19406. The report shall specify the source involved, the test results, and corrective action taken.
- G. The licensee is authorized to collect leak test samples for analysis by the licensee. Alternatively, tests for leakage and/or contamination may be performed by persons specifically licensed by the Commission or an Agreement State to perform such services.
13. The licensee is authorized to hold radioactive material with a physical half-life of less than or equal to 90 days for decay-in-storage before disposal in ordinary trash, provided:
- A. Waste to be disposed of in this manner shall be held for decay a minimum of ten half-lives.
 - B. Before disposal as ordinary trash, the waste shall be surveyed at the container surface with the appropriate survey instrument set on its most sensitive scale and with no interposed shielding to determine that its radioactivity cannot be distinguished from background. All radiation labels shall be removed or obliterated.
 - C. A record of each such disposal permitted under this License Condition shall be retained for three years. The record must include the date of disposal, the date on which the byproduct material was placed in storage, the radionuclides disposed, the survey instrument used, the background dose rate, the dose rate measured at the surface of each waste container, and the name of the individual who performed the disposal.
14. The licensee shall not use licensed material in or on human beings or in field applications where activity is released except as provided otherwise by specific condition of this license.

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(Continued)

CONDITIONS

15. Experimental animals administered licensed materials or their products shall not be used for human consumption.
16. In lieu of using the conventional radiation caution colors (magenta or purple on yellow background) as provided in 10 CFR 20.203(a)(1), the licensee is hereby authorized to label detector cells and cell baths, containing licensed material and used in gas chromatography devices, with conspicuously etched or stamped radiation caution symbols.
17. Detector cells containing a titanium tritide foil or a scandium tritide foil shall only be used in conjunction with a properly operating temperature control mechanism which prevents foil temperatures from exceeding that specified by the manufacturer.
18. The licensee shall conduct a physical inventory every 6 months to account for all sources and/or devices received and possessed under the license. Records of inventories shall be maintained for 5 years from the date of each inventory.
19. The licensee may transport licensed material in accordance with the provisions of 10 CFR 71, "Packaging and Transportation of Radioactive Material."
20. Installation, initial radiation survey, relocation, removal from service, maintenance, and repair of devices containing sealed sources shall be performed by individuals designated by the University Radiation Safety Committee or by persons specifically licensed by the Commission or an Agreement State to perform such services. Installation, replacement, and disposal of sealed sources shall be performed only by persons specifically licensed by the Commission or an Agreement State to perform such services.
21. Prior to initial use and after installation, relocation, dismantling, alignment, or any other activity involving the source or removal of the shielding, the licensee shall assure that a radiological survey is performed to determine radiation levels around, above and below the gauge with the shutter open. This survey shall be performed only by individuals designated by the University's Radiation Safety Committee or by persons authorized to perform such services by the Commission or an Agreement State. A record of the results of this survey shall be maintained.

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(Continued)

CONDITIONS

22. Except as specifically provided otherwise in this license, the licensee shall conduct its program in accordance with the statements, representations, and procedures contained in the documents including any enclosures, listed below. The Nuclear Regulatory Commission's regulations shall govern unless the statements, representations and procedures in the licensee's application and correspondence are more restrictive than the regulations.

- A. Application dated September 24, 1990
- B. Letter dated November 6, 1990
- C. Letter dated April 18, 1991
- D. Letter dated December 27, 1991
- E. Letter dated March 23, 1992
- F. Letter dated June 26, 1992
- G. Letter dated August 17, 1992
- H. Letter dated May 19, 1995
- I. Letter dated July 19, 1995
- J. Letter dated October 11, 1995



Date OCT 12 1995

For the U.S. Nuclear Regulatory Commission

Original Signed By

Tara Weidner

By

Nuclear Materials Safety Branch
Region I

King of Prussia, Pennsylvania 19406

OCT 12 1995

Jack C. Faust
Director of Occupational Health and Safety
Princeton University
Forrestal Campus
Princeton, New Jersey 08544-0710

Dear Mr. Faust:

This refers to your license amendment request. Enclosed with this letter is the amended license.

Please review the enclosed document carefully and be sure that you understand and fully implement all the conditions incorporated into the amended license. If there are any errors or questions, please notify the U.S. Nuclear Regulatory Commission, Region I office, the Licensing Assistance Section, (610) 337-5093 or 5239, so that we can provide appropriate corrections and answers.

Thank you for your cooperation.

Sincerely,

Original Signed By
Tara Weidner

Tara L. Weidner
Nuclear Materials Safety Branch No. 1
Division of Nuclear Materials Safety

License No. 29-05185-24
Docket No. 030-00882
Control No. 122086

Enclosure:
Amendment No. 57

DOCUMENT NAME: R:\WPS\MLTR\L2905185.24

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NAME	TLWeidner/tlw					
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Princeton University

Office of Occupational Health & Safety
113 Chemical Sciences Building
James Forrestal Campus
Princeton, New Jersey 08544-0710
(609) 258-5294

MS 16
J-9

October 11, 1995

Ms. Tara L. Weidner
Nuclear Materials Safety Branch
Division of Radiation Safety & Safeguards
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406-1415

RE: License No. 29-05185-24
Control No. 122086

Dear Ms. Weidner:

As a result of your letter dated July 31, 1995, and subsequent later telephone conversations with you, Princeton University is providing the following information regarding the University's interim radioactive waste storage plan. Princeton University does not plan to store any radioactive waste on a long-term basis. All short-lived radioactive wastes are disposed of through a Decay-In-Storage Program, and wastes contaminated with long-lived isotopes (isotopes with half-lives in excess of 90 days) will be shipped in a timely manner to the Chem-Nuclear disposal facility in Barnwell, SC. As a result of the University's Decay-in-Storage Program and other waste minimization efforts, the University has reduced the volume of radioactive waste shipped out for disposal by more than a factor of ten in the last ten years. For the foreseeable future Princeton University expects to ship out approximately five 55-gallon drums a year of waste that will require permanent disposal.

If you have any further questions regarding waste storage, please contact Sue Dupre, Robert Milwicz or me at (609)258-5294.

Very truly yours,

Jack C. Faust
Jack C. Faust
Director

JCF/SMD/smd

c: Dr. Pamela Bowen
Sue M. Dupre
Michael Fredericks
Alice Lustig

Robert Milwicz
Dean J. Montero
Prof. William Happer
Radiation Safety Committee

file 9.1

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FAX REC'D

122086
OCT 11 1995

JUL 31 1995

License No. 29-05185-24
Docket No. 030-00882
Control No. 122086

Jack C. Faust, Director
Office of Occupational Health
and Safety
Princeton University
113 Chemical Sciences Building
James Forrestal Campus
Princeton, NJ 08544-0710

Dear Mr. Faust:

This is in reference to your request in a letter dated July 19, 1995 to amend License No. 29-05185-24. In order to continue our review, we need the following additional information.

To ensure the safe interim storage of radioactive waste, the NRC is requiring licensees who generate waste to implement a waste storage plan. If you intend to store waste until a disposal site becomes available, you must submit a waste storage plan which contains all the information in the enclosed Information Notice 90-09.

We will continue our review upon receipt of this information. Please reply in duplicate to my attention at the Region I office and refer to Mail Control No. 122086. If you have any technical questions regarding this deficiency letter, please call me at (610)337-5272 .

If we do not receive a reply from you within 30 calendar days from the date of this letter, we shall assume that you do not wish to pursue your application.

Sincerely,

Original Signed By
Tara Weidner

Tara L. Weidner
Nuclear Materials Safety Branch
Division of Radiation Safety
and Safeguards

Enclosures:

1. Information Notice 90-09

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Jack C. Faust, Director

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OFFICE	DRSS/RI	N					
NAME	TLWeidner/tlw						
DATE	07/28/95	07/	/95	07/	/95	07/	/95

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Princeton University

Office of Occupational Health & Safety
113 Chemical Sciences Building
James Forrestal Campus
Princeton, New Jersey 08544-0710
(609) 258-5294

030-00882

July 19, 1995

License Nos.: 29-05185-24
29-05185-25
SNM-356
SUD-381

Docket Nos.: 030-00882
030-12287
070-00391
040-05259

Mr. Mohamed Shanbaky, Chief
Nuclear Materials Safety, Section B
Division of Radiation Safety & Safeguards
U. S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Dear Mr. Shanbaky:

Enclosed are materials relating to recent changes in the Princeton University Radiation Safety Guide. These materials include an updated Revision Log, as well as pages 15.1-15.3, 15.6, and 15.9 (dated June 1, 1994) and pages iii-iv, 15.4-15.5, 15.7-15.8, and 8.1-8.4 (dated May 16, 1995).

Our records indicate that you have one copy of the Princeton University Radiation Safety Guide, and we ask that you integrate the enclosed pages as indicated on the revision sheet.

Very truly yours,

Karen E. Bauer

Karen E. Bauer
Manager of Administrative Services

kb

cc: file 9.1

Enclosure as per text

122086

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JUL 25 1995

REVISION LOG

To help ensure that your University Radiation Safety Guide is kept complete and current, the following log is provided to you as a summary of revisions made to the 4th Edition of the Guide. This log should be kept in the front of your Guide until the next revision and its accompanying revision log are issued.

All pages in the Guide are dated December 5, 1979, except for the following pages:

Dated December 7, 1979	Pages 15.1 - 15.2	(superseded 11/20/91)
	15.5 - 15.7	(superseded 11/20/91)
Dated March 15, 1983	Pages B.1 - B.14	(superseded 12/20/89)
Dated September 20, 1985	Pages A.1 - A.3	(superseded 8/22/86)
Dated October 23, 1985	Pages i	(superseded 11/20/91)
	ii	(superseded 11/20/91)
	iii	(superseded 11/20/91)
	1.1 - 1.6	
	2.1 - 2.4	
	4.1 - 4.6	(4.4 superseded 11/20/91)
	6.1 - 6.2	
	9.1 - 9.5	(9.2 superseded 9/15/89)
	10.2 - 10.7	(superseded 4/10/91)
	11.1 - 11.3	
	12.1	
	12.2 - 12.4	(superseded 4/10/91)
	12.5	
Dated August 22, 1986	Pages A.1 - A.4	(superseded 7/1/87)
Dated September 5, 1986	Page 12.2	(superseded 4/10/91)
Dated March 25, 1987	Page 10.4	(superseded 4/10/91)
Dated July 1, 1987	Pages A.1 - A.4	(superseded 7/1/88)
Dated July 1, 1988	Pages A.1 - A.4	(superseded 9/15/89)
Dated September 15, 1989	Pages 6.3	
	9.1 - 9.3	(9.2 superseded 11/20/91)
(editorial changes only -	10.1	(superseded 4/10/91)
forms revision project)	15.3 - 15.4	(superseded 11/20/91)
	17.1	
	17.4	
	A.1 - A.4	(superseded 9/15/90)

Dated December 20, 1989

Pages B.1 - B.14

~~Dated September 15, 1990~~

~~Pages A.1 - A.4 (superseded 9/15/91)~~

Dated April 10, 1991

~~Title page (superseded 11/20/91)~~
~~Pages ii (superseded 11/20/91)~~
~~8.1 - 8.5 (8.3-8.5 superseded 11/20/91)~~
~~(8.1-8.4 superseded 5/16/95)~~
~~10.1 - 10.7 (superseded 11/20/91)~~
~~12.2 - 12.4 (12.4 superseded 11/20/91)~~

~~Dated September 15, 1991~~

~~Pages A.1 - A.4 (superseded 7/1/92)~~

Dated November 20, 1991

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14.1 - 14.6
~~15.1 - 15.9 (superseded 6/1/94 & 5/16/95)~~
16.1

Dated July 1, 1992

Pages A.1 - A.4 (A.2 - A.4 superseded 11/30/92)

~~Dated November 30, 1992~~

~~Pages A.2 - A.4 (superseded 9/30/94)~~

Dated September 30, 1994

Pages A.1 - A.4

Dated June 1, 1994

Pages 15.1 - 15.3
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Dated May 16, 1995

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- B. Concentrations in Air and Water Above Natural Background
- C. Basic Quantities and Body Burdens for Various Radioisotopes
- D. Maximum Permissible Doses and Concentrations

8. Receipt and Opening of Packages Containing Radioisotopes

A. Package Monitoring Requirements

Paragraph 20.1906 of "10 CFR Part 20" requires that certain packages of radioactive materials be leak tested and surveyed for radiation levels promptly (within three hours after receipt, if the package is received during normal working hours). A *monitoring-required* package is any package bearing Department of Transportation (DOT) Radioactive White-I, Radioactive Yellow-II or Radioactive Yellow-III labels on its outer surfaces. A *monitoring-required* package also includes any radioactive materials package which shows evidence that the package integrity is not intact, e.g., a crushed, wet or damaged package.

The "Authorized User" is responsible for ensuring that any radioactive materials packages received in the laboratory are surveyed as required. To assist the "Authorized User," procedures have been set up to allow the Office of Occupational Health and Safety to survey *monitoring-required* packages and keep the required records.

B. Package Monitoring Program

1. Certain departments have established procedures by which any *monitoring-required* package is surveyed before it is delivered to an "Authorized User's" laboratory. In those departments, receiving room personnel notify the Office of Occupational Health and Safety that a *monitoring-required* package has been received. The package survey is conducted at the receiving room by the Office of Occupational Health and Safety and an OHS Package Survey and Release label is affixed to the package indicating that the survey has been performed. The package is delivered to the "Authorized User's" laboratory only after the Office of Occupational Health and Safety notifies receiving room personnel that the package may be released.
2. In those departments where a general procedure for the survey of *monitoring-required* packages in the receiving room has not been established, it is the responsibility of each "Authorized User" to notify the Office of Occupational Health and Safety that a *monitoring-required* package has been delivered. In such a case the following conditions apply:
 - a) The "Authorized User" must notify the Office of Occupational Health and Safety immediately that a *monitoring-required* package has been delivered. Regulations require that the survey

be performed within three hours after the delivery of the package to the University.

- b) The package cannot be opened until the Office of Occupational Health and Safety has monitored the package and notified the "Authorized User" that the package has been released for use.
- c) The Office of Occupational Health and Safety will survey the package and will affix an OHS Package Survey and Release label to the package. However, the package cannot be opened until the Office of Occupational Health and Safety has provided verbal confirmation to the "Authorized User" that the package is released for use.

C. Release of Packages to the Laboratory

To ensure traceability of radioisotope packages received at the University, receiving room personnel will not release radioisotope packages to any laboratory without obtaining a signature from a representative of that laboratory.

D. General Procedures for the Receipt of Packages in the Laboratory

The following procedures apply to the receipt of any radioactive materials packages in an "Authorized User's" laboratory:

1. Certain departments may have special requirements for the receipt of packages in the laboratory, including procedures which allow only a limited number of designated individuals to sign for the package. Laboratory personnel must be familiar with departmental procedures for the receipt of radioactive material packages.
2. Before any person in the laboratory signs for a package, he or she must verify by examining the packing slip and the labels on the package that the package presented is the same package identified on the receipt record on which the signature is made.
3. If a *monitoring-required* package (i.e., a package bearing DOT Radioactive White-I, Radioactive Yellow-II or Radioactive Yellow-III labels or a damaged package) is delivered and the package does not bear the dated OHS Package Survey & Release sticker, then the person who signs for the package is responsible for immediately notifying the Office of Occupational Health and Safety that a *monitoring-required* package has been received in the laboratory.

4. Any person who signs for a package is responsible for ensuring that the package is secured. If the package cannot be opened promptly, it must be immediately placed in a secure location.
5. Any person who signs for a package is responsible for promptly notifying the person who will use the radioisotope that the package has arrived.

E. General Procedures for Opening Packages

The following procedures apply to the opening of any radioactive materials package:

1. Packages must be opened in a properly equipped laboratory and only by the "Authorized User" or by an adequately trained individual designated by the "Authorized User."
2. Inspect the packing slip and verify that the package contains the material as ordered in the expected amount. After the package has been opened, inspect the label on the radioactive material vial or container to verify that it contains the material ordered.
3. If there are any discrepancies between the original order and the material actually sent, notify the Office of Occupational Health and Safety immediately. Arrangements for the replacement of an incorrect order are made through the Purchasing Department and the Office of Occupational Health and Safety.
4. Open packages in a fume hood. Wear protective clothing and use any appropriate protective equipment such as shields, tongs, etc.
5. Survey the outer surface of the package and report instances of unusual radiation levels to the Office of Occupational Health and Safety. Measurements of radiation levels for even those packages for which external radiation is not expected, such as H-3, may detect a package which contains the wrong isotope.
6. As the package is opened, survey each successive layer of packing material or packing containers for contamination. Leak test the inner container for gross contamination, making certain to look for signs of leakage. Significant removable contamination at any point, including extensive contamination on the inner vial, should be reported immediately to the Office of Occupational Health and Safety.
7. Supply additional shielding for the inner container as necessary.

8. Dispose of contaminated packing material as radioactive waste.

F. Disposition of Packaging Materials

1. Make sure any box or packaging material is not contaminated and does not contain radioactive materials before placing the packaging out for disposal or sending it for recycling.
2. Deface or remove radioactive material labels on any empty packaging before placing the package out for pickup as nonradioactive trash. This is an NRC requirement.

G. After Hours Receipt

The receipt of radioactive material packages after hours, i.e., after receiving areas have closed for the day, rarely occurs and arranging for the receipt of such a package is not encouraged. However, a carrier may attempt to deliver a package after hours due to inclement weather or other special circumstances. The following conditions apply to the after hour delivery of packages:

1. The Public Safety Office will not accept delivery of radioactive materials packages.
2. The Public Safety Office will not allow a carrier to deliver a package to any department unless that department or the "Authorized User" has made special arrangements with the Public Safety Office.
3. In the event an after hours delivery has been arranged, it is the responsibility of the "Authorized User" to contact the Office of Occupational Health and Safety in advance to arrange for the monitoring of any *monitoring-required* package.

H. Other Requirements

Paragraph 20.1906 of "10 CFR 20" specifies other requirements, such as arrangements for the receipt of packages containing very large amounts of radioactivity. The "Health Physicist" will discuss any special requirements for the receipt and handling of unusual packages during the authorization process.

15. RADIOACTIVE WASTE DISPOSAL

Issues about the manner and method of radioactive waste disposal, about which wastes are acceptable for disposal, and about whether facilities exist to accept radioactive waste for disposal are complex and rapidly-changing. For many years the University has been able to send its radioactive wastes for final disposal to out-of-state commercial waste disposal facilities. However, there are at present no waste disposal facilities which will accept radioactive waste, with the exception of liquid scintillation wastes, from generators in the state of New Jersey.

To some extent the University can take action to alleviate the pressure on resources, research and facilities that is created by the inability to dispose of radioactive waste. For instance, the University can utilize alternative means of disposal such as decay-in-storage of short-lived radioisotopes. Although the volume of radioactive waste which must be stored on campus can be minimized, it will remain necessary for several years to store certain long-lived radioactive wastes until other disposal routes become available.

There are strict requirements placed on each waste generator by federal, state and local authorities regarding waste form, waste packaging and the design and operation of waste storage facilities. The programs and procedures which are described below have been established to ensure that radioactive wastes generated at the University are stored and disposed of in compliance with all federal, state and local regulations.

A. Disposal Options

Radioactive wastes generated at Princeton University may be disposed of through several avenues. These options are described in the following paragraphs.

1. Certain short-lived isotopes are disposed of through the centralized Decay-in-Storage (DIS) Program, operated by the Molecular Biology Department, for ultimate disposal as nonradioactive waste.
2. Certain liquid wastes may be disposed of through the sanitary sewer.
3. Liquid scintillation wastes are disposed of through a contracted radioactive waste disposal services broker.

4. Radioactive wastes which do not meet the criteria for any other disposal option must be stored in a Princeton University Radioactive Waste Interim Storage Facility until a disposal route becomes available.
5. Regardless of the disposal option used, specific departmental arrangements for the disposal and collection of radioactive waste vary and should be carefully checked with the "Departmental Health and Safety Coordinator" and/or the departmental manager. All steps in the procedures, including selection of a waste container, designation of the container for a particular type of waste, lining of the container, addition of any necessary absorbent, keeping account of and limiting the amount of liquid that goes into a container, labelling, etc., are done by either a representative of the "Authorized User" or the departmental waste manager, depending on specific departmental procedures.

B. Waste Collection and Storage in the Laboratory

Prior to the startup of radioisotope use in a laboratory, the "Authorized User" must contact the Office of Occupational Health and Safety to arrange for a waste disposal orientation session for the "Authorized User" and appropriate laboratory personnel. During the orientation session, waste disposal categories and procedures are explained, and a decision is made concerning the particular types of waste disposal containers to be placed in the laboratory, based on laboratory needs and financial considerations.

The following procedures and guidelines are applicable to the laboratory collection and storage of any form of radioactive waste, regardless of the manner of final disposal:

1. The date, radioisotope, and amount of radioactive materials placed in a waste container must be recorded on a waste record card, OHS-HP Forms 210 - 215, or on an equivalent form. A reasonable but conservative estimate of the activity is sufficient if an accurate figure is not possible. Waste is not acceptable for disposal unless it is accompanied by a completed waste record card.
2. Radioactive wastes may not be placed into waste containers intended for non-radioactive wastes.
3. Radioactive material waste containers should not be used for non-radioactive wastes nor should they be used as disposal containers for other toxic wastes.
4. Each radioactive material waste container in the laboratory, once it has been designated for use for a particular type of radioactive

waste, i.e., liquid scintillation counting waste, solid decay-in-storage waste, interim storage waste, etc. should be labelled to indicate its designation.

5. The chemical compatibility and hazard characteristics of radioactive waste placed within the same container should always be considered.
6. Fermentation and degradation of biological radioactive wastes should be minimized with the addition to such wastes of bleach or other appropriate disinfectants.
7. Radioactive material waste containers shall be placed in a safe location to prevent damage and should be kept well separated from non-radioactive material waste cans to avoid cross-contamination.
8. Careful consideration should be given to external dose rates created by gamma, neutron and high energy beta emitters placed in the waste containers. It may become necessary to shield the materials or the waste container or to relocate the container to a less accessible area.
9. Only authorized radioactive material waste containers provided by the waste disposal services broker, the decay-in-storage facility operator, or approved by the "Health Physicist" may be used for waste storage or shipment. The use of other than authorized containers for waste storage within the laboratory is discouraged, since custodial personnel are trained to recognize the authorized containers, but may be allowed after consultation with the "Health Physicist."
10. Each waste container used for radioactive waste collection in laboratories and each container used for the subsequent storage or shipment of wastes shall be inspected for corrosion or damage which could affect the integrity of its containment, prior to its being placed in service. Containers used for the local collection of wastes and/or for extended periods of time shall be inspected regularly. Containers whose integrity is suspect shall not be used for waste collection or shipment.
11. The contents of each radioactive material waste container shall be inspected by a laboratory or departmental representative prior to removal from the laboratory to ensure that the wastes are properly separated and packaged in accordance with applicable procedures.

C. Decay-in-Storage Program

The University's NRC broad license permits the University to dispose of certain radioactive materials through a decay-in-storage program,

June 1, 1994

provided that various conditions are met. Under the Decay-In-Storage (DIS) Program, wastes contaminated with certain short-lived isotopes will be collected from the laboratories for storage in specially designed liquid and solid waste facilities. After storage for a minimum of ten half-lives, solid wastes are rigorously surveyed, and if no activity distinguishable from background levels is found, then the wastes are disposed of as nonradioactive medical wastes. The detailed waste disposal procedures necessary for proper segregation and packaging of DIS wastes are available from the Molecular Biology Department. The following items summarize the program:

1. Radioisotopes permitted to be disposed of through the Solid Waste Decay-in-Storage Program must have half-lives less than 65 days. This includes radioisotopes such as P-32, P-33, Cr-51, and I-125.
2. Radioisotopes permitted to be disposed of through the Liquid Waste Decay-in-Storage Program must have half-lives of less than 90 days. This includes P-32, P-33, S-35, Cr-51 and I-125.
3. Only containers obtained through the DIS Program may be used for the collection of DIS liquid and solid wastes in the laboratory. These containers, which are clearly labelled as DIS containers, may be obtained from the DIS Facilities operator.
4. Wastes contaminated with short-lived isotopes and intended for disposal through the DIS Program must be strictly segregated in the laboratory from all other radioactive wastes. DIS wastes themselves must be segregated by isotope to as large an extent as possible. Waste from an experiment with dual labelling, e.g., utilizing a short-lived isotope such as P-32 and a longer-lived isotope such as H-3, must be disposed of as radioactive waste through the Interim Radioactive Waste Storage Program rather than as DIS waste.
5. High activity (multimillicurie) waste materials should be separated from lower activity materials in the laboratory to decrease the volume of wastes that must be stored in the DIS Facilities for more than ten half-lives.
6. Before an item is placed into a DIS solid waste container, radioactive materials labels must be removed, if possible, or thoroughly obliterated or covered. Wastes containing items with visible radioactive materials labels will not be accepted for storage in the DIS facilities.
7. Liquid scintillation counting wastes contaminated with short-lived isotopes are not stored separately as DIS wastes. Due to low disposal costs for liquid scintillation counting wastes and the

complexities of the DIS procedures, all liquid scintillation counting wastes, regardless of the contaminating isotope, are picked up and disposed of by the waste disposal service vendor.

D. Liquid Scintillation Wastes

1. Liquid scintillation wastes (including wastes contaminated with short-lived isotopes) are transported for disposal by the University's radioactive waste disposal services broker. Specific procedures for the packaging, storage and disposal of liquid scintillation wastes are available from the Office of Occupational Health and Safety.
2. Only liquid scintillation counting solutions with flashpoints of 140°F or greater are acceptable for disposal. A list of acceptable counting solutions is available from the Office of Occupational Health and Safety.
3. Waste collection of filled 30- and 55-gallon drums is made by the broker, as needed, and is scheduled through the Office of Occupational Health and Safety. Approximately two weeks before a scheduled pickup, the Office of Occupational Health and Safety contacts "Authorized Users" or departmental waste managers, as appropriate, to determine the number of waste containers to be picked up and the number of replacement containers to be delivered.

E. Centralized Interim Radioactive Waste Storage Program

The Office of Occupational Health and Safety administers a centralized radioactive waste Interim Storage Program for any radioactive waste which is not suitable for disposal through the DIS Program or for sewer disposal. General features of the Interim Storage Program are described below. The detailed waste collection and packaging procedures for Interim Storage wastes are available from the Office of Occupational Health and Safety.

1. Wastes which must be stored through the Interim Storage Program include solid wastes contaminated with any radioisotope with a half-life equal to or greater than 65 days.
2. Most of the University's Interim Storage Waste is ultimately packaged in 30- and 55-gallon drums, which are stored in an on-campus facility designed to meet the Nuclear Regulatory Commission's interim storage facility criteria. Some wastes may be sent out for processing such as compaction, shredding or incineration in order to reduce waste volumes. These processed wastes are returned to the University for continued storage in the Interim Storage Facility.

3. The generation of non-routine wastes, such as odd-shaped, exotic, or unusually large materials, require that the Office of Occupational Health and Safety be contacted as soon as the disposal need is recognized so arrangements can be made for storage containers and for special handling.
4. Special arrangements must be made for the storage of wastes which include discrete radioactive sources, radium, radium-contaminated objects, thorium and uranium compounds, and transuranics.
5. Anyone who is contemplating the use of radium and transuranics should be aware that it may not be possible to arrange for the disposal of radium and transuranics even after the interim storage period has ended. Users should also be aware that uranium and thorium compounds, especially thorium nitrate or uranium nitrate, are easily obtainable but are difficult to dispose of.

F. Sanitary Sewage System

Use of the University sanitary sewage system as a primary means of radioisotope waste disposal is prohibited except under very specific conditions. The careful control of sewer disposal is necessary because the permissible water concentrations established by regulations are extremely low. The disposal of certain isotopes is permitted, however, subject to the following conditions:

1. General Requirements

- a. No radioactive material may be placed into the sanitary sewer unless it is aqueous and readily soluble in water or readily dispersible biological material.
- b. The pH of any materials added to the sewer must be greater than or equal to 5 and less than or equal to 9.
- c. A record of all sewer disposals must be kept and reported monthly to the Office of Occupational Health & Safety on OHS-HP Form #203, the Radioactive Waste and Release Report. The report is due at the Office of Occupational Health and Safety **no later than** the eighth day of the following month. These data are used to ensure the University's compliance with monthly average concentration and yearly total limits.

2. Specific Sewer Waste Streams

The general requirements stated above apply to each of the specific waste streams described below:

June 1, 1994

a. Disposals via the Liquid Waste Decay-in-Storage Facility

Disposals must be made in accordance with the Decay-in-Storage Facility operating procedures approved by the Radiation Safety Committee.

b. Secondary Disposals

The "secondary disposal" of radioactive material to the sanitary sewer is defined as the disposal of liquids containing low concentrations of radioactive materials, including rinses of contaminated glassware and other equipment and the disposal of very small amounts of radioactivity in large volumes of liquid, e.g. sequencing buffer solutions.

The "secondary disposal" of any radioisotope by an "Authorized User" is permitted, provided the following conditions are met:

- (1) The combined total activity, regardless of isotope, for all "secondary disposals" made by each "Authorized User" and all persons using radioisotopes under his or her authorization must not exceed 100 μCi per day, when averaged over a seven day week.
- (2) For each specific individual isotope, the total activity per day, when averaged over a seven day week, in all "secondary disposals" made by each "Authorized User" and all persons using radioisotopes under his or her authorization must not exceed the amount specified in the following table:

<u>Radioisotope</u>	<u>"Secondary Disposal" Limits (μCi)</u>
H-3	100
C-14	100
P-32	10
P-33	100
S-35	100
Ca-45	100
Cr-51	100
I-125	1

The "Health Physicist" must be consulted for "secondary disposal" limits for other radioisotopes.

- (3) The "secondary disposal" of radioactive materials using sinks in an "Authorized User's" laboratory is permitted

provided that the sinks have been labelled for "secondary disposal" by the Office of Occupational Health & Safety. The "Authorized User" is strongly encouraged to designate only one or two sinks to be used for "secondary disposal."

- (4) An "Authorized User" may apply to the Office of Occupational Health & Safety to request exceptions to the "secondary disposal" activity limits. Such requests for exceptions may be approved, subject to review by the "Health Physicist" on a case-by-case basis, and subject to limitation such that the University will not exceed the overall activity release limits established by regulation.

c. Primary Disposals

The "primary disposal" of liquids to the sanitary sewer is defined as the disposal of radioactive liquids under conditions which do not meet the criteria for "secondary disposals," i.e., the disposal of quantities in excess of the limits in paragraph 15.D.2.b.(2) or the disposal of relatively high concentrations, regardless of activity.

- (1) At present only the "primary disposal" of H-3 and C-14 is permitted. If the "primary disposal" of liquids containing long-lived isotopes other than H-3 and C-14 becomes necessary, the "Health Physicist" may approve such disposals on a case-by-case basis.
- (2) The "primary disposal" of any isotopes with half-lives less than 90 days is not permitted. Such isotopes are disposed of through the Decay-in-Storage Program.
- (3) Only designated sinks, which have been specifically approved and labelled by the Office of Occupational Health & Safety, may be used for "primary disposals." Each department is strongly encouraged to carefully limit the number of sinks which can be used for "primary disposal."
- (4) The Office of Occupational Health & Safety must be notified in advance of any "primary disposal." It may occasionally be necessary to put limitations on the amount of H-3 and C-14 which can be disposed of in a given day in order to limit the daily average concentrations to meet sewer authority regulations.

May 16, 1995

G. Mixed Wastes

Mixed wastes are wastes containing both radioactive materials and hazardous waste components regulated under RCRA (the Federal Resource Conservation and Recovery Act). Currently no disposal site licensed for the disposal of radioactive wastes is also licensed to accept hazardous wastes for disposal. Consequently, mixed wastes are prohibited from land disposal, and the options for disposing of mixed wastes are extremely limited and essentially nonexistent.

In the laboratory setting the types of mixed wastes most likely to be generated include contaminated lead and certain organic solvents such as chloroform, phenol, xylene, and toluene. It is the responsibility of the "Authorized User" to ensure that wastes presented for disposal through the centralized radioactive waste disposal program do not contain mixed wastes. The Office of Occupational Health and Safety is available to help an "Authorized User" make a determination about the nature of his or her wastes.

If the generation of mixed wastes is unavoidable, then the "Authorized User" must contact the "Health Physicist" to establish waste packaging and storage procedures for those materials.

All "Authorized Users" are strongly encouraged to use laboratory techniques or to develop new techniques which do not result in the production of mixed wastes.

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 03610
STATUS CODE: 0
FEE CATEGORY: EX 3L 2C
EXP. DATE: 19960630
FEE COMMENTS: 170.11(A)(4)
DECOM FIN ASSUR REQD: Y

LICENSE FEE TRANSMITTAL

A. REGION

1. APPLICATION ATTACHED

APPLICANT/LICENSEE: PRINCETON UNIVERSITY
RECEIVED DATE: 950725
DOCKET NO: 3000882
CONTROL NO.: 122086
LICENSE NO.: 29-05185-24
ACTION TYPE: AMENDMENT

2. FEE ATTACHED

AMOUNT: -----
CHECK NO.: -----

3. COMMENTS

Reference 122087,
122088 & 122089

SIGNED
DATE

Rebecca J. Brown
7/26/95

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED) 1

1. FEE CATEGORY AND AMOUNT: EX 3L 2C 170.11(A)(4)

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:

AMENDMENT -----
RENEWAL -----
LICENSE -----

3. OTHER -----

SIGNED
DATE

Rebecca J. Brown
8/3/95

RECEIVED BY	
Date	8/3/95
By	August 1, <i>B. Brown</i>
Date of	8/3/95

Also see
122087,
122088 +
122089