NRC FORM 313
(1-84)
10 CFR 30, 32, 33, 34, 35 and 40

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

APPLICATION FOR MATERIAL LICENSE

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.

FEDERAL AGENCIES FILE APPLICATIONS WITH:

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

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

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

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

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

U.S. NUCLEAR REGULATORY COMMISSION, REGION II
MATERIAL RADIATION PROTECTION SECTION
101 MARIETTA STREET, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

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

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

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

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

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

U.S. NUCLEAR REGULATORY COMMISSION, REGION V
MATERIAL RADIATION PROTECTION SECTION
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CA 94596

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

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

- [ ] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER ______
- [X] C. RENEWAL OF LICENSE NUMBER 34-18196-01

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

Northeastern Ohio Universities College of Medicine
4209 State Route 44
Rootstown, Ohio 44272

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

4209 State Route 44
Rootstown, Ohio 44272

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Michael D. Powell, Institutional and Radiation Safety Officer

TELEPHONE NUMBER

216-325-2511, Ext.439

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

5. RADIOACTIVE MATERIAL
a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.

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

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

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

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSEE FEES (See 10 CFR 170 and Section 170.31)
FEE CATEGORY Exempt
AMOUNT ENCLOSED $ 0.00

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

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

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948, 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

SIGNATURE—CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
Glenn A. Saltzman	Glenn A. Saltzman	Director, Division of Basic Medical Sciences	3/28/85

14. VOLUNTARY ECONOMIC DATA

a. ANNUAL RECEIPTS

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

b. NUMBER OF EMPLOYEES (Total for entire facility excluding outside contractors)
225

c. NUMBER OF BEDS
–

d. WOULD YOU BE WILLING TO FURNISH COST INFORMATION (dollar and/or staff hours) ON THE ECONOMIC IMPACT OF CURRENT NRC REGULATIONS OR ANY FUTURE PROPOSED NRC REGULATIONS THAT MAY AFFECT YOU? (NRC regulations permit it to protect confidential commercial or financial—proprietary—information furnished to the agency in confidence)

- [X] YES
- [ ] NO

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS	APPROVED BY
			RECEIVED APR 01 1985 REGION III	
AMOUNT RECEIVED	CHECK NUMBER			DATE

PRIVACY ACT STATEMENT ON THE REVERSE

8506070541 850522
REG3 LIC30
34-18196-01 PDR

ITEM #5 - Radioactive Material

I. Radioisotopes

a) Element and mass number.

Any byproduct material of atomic numbers 1 - 83.

b) Chemical and/or physical form.

Any chemical or physical form.

c) Maximum possession limits.

A total of 2.5 curies, with a limit of 100 millicuries for each radionuclide with the following exceptions:

1) ^{3}H - 400 millicuries

2) ^{14}C - 200 millicuries

3) ^{125}I - 200 millicuries

4) ^{32}P - 200 millicuries

II. Sealed or Plated Sources

Any sealed or plated sources of atomic numbers 1 through 83 in quantities not to exceed 20 millicuries.

ITEM #6 - **Purposes for Which Licensed Material Will Be Used**

Byproduct material will be used in biomedical research and teaching. Examples of our current and anticipated uses are as follows:

1) ^{3}H

a) Radioimmunoassay of serum hormone levels from experimental animals.
b) Radioligand receptor binding assays and in vitro autoradiographic receptor localization.
c) Labeling of cells in tissue culture.
d) Labeling of proteins, column chromatography, and gel and electrophoresis.
e) Metabolic labeling of DNA, RNA, glycoproteins and glycolipids.
f) Alkylation of cysteine residues in proteins.
g) Measure rates of DNA and RNA synthesis in bacterial cultures.
h) Preparation of labeled plasmids as markers for cesium chloride equilibrium density banding.
i) Tracing of neural connections between different parts of the brain via autoradiographic analysis.
j) Conduct autoradiographic studies of cerebral glucose metabolism in experimental animals.
k) Metabolic labeling of viral and cellular components.
l) Assay of cholesterol hydroxylation.

2) ^{14}C

a) Assay of cholesterol hydroxylation.
b) Labeling of proteins, lipids, viral and cellular components.
c) Autoradiographic analysis of radiolabeled animal tissues for metabloic studies.
d) Autoradiographic analysis of neural connections.
e) Measurement of hormone blood levels.
f) Measure rates of DNA and RNA synthesis in bacterial cultures.
g) Preparation of labeled plasmids as markers for cesium chloride equilibrium density banding.
h) Alkylation of cysteine residues in proteins.
i) Column chromatography and gel or paper electrophoresis.
j) Tracing of enzyme induction in vivo and in vitro.
k) Metabolic labeling of viral and cellular components.

3) ^{32}P

a) Metabolic labeling of nucleic acids, phospholipids, and proteins.
b) Preparation of labeled plasmids for markers for cesium chloride equilibrium density banding.
c) Preparation of labeled substrates for metabolic studies.

4) ^{35}S

a) Labeling of proteins for enzymatic and metabolic studies.

b) Labeling of proteins for two-dimensional electrophoresis.
c) Labeling of nucleic acids for sequencing studies.
d) Labeling of antibodies.

5) ^{51}Cr

a) Labeling of cells in tissue culture.
b) Immunological cytotoxicity assays.

6) ^{85}Sr

a) Will be used to measure blood flow in body organs with labeled microspheres.

7) ^{125}I, ^{131}I

a) Labeling of proteins for radioimmunoassay, column chromatography, gel electrophoresis.
b) Cell receptor binding studies in tissue culture.
c) Autoradiographic receptor localization and binding analysis.
d) Study of vascular permeability in lung injury in experimental animals.
e) Labeling of virus surface proteins.
f) Labeling of proteins for peptide maping studies.

8) ^{141}Ce

a) Measurement of blood flow in body organs with labeled microspheres.

Activity levels for the above uses shall be consistant with the maximum permissible quantities outlined in item #9. Activity levels for experimental animals will normally be in the uCi range, and shall never exceed 2 mCi per animal.

ITEM #7 - **Training and Experience of Radiation Safety Officer and Authorized Users**

On August 22, 1984, the NRC approved amendment 12 to License No. 34-18196-01 making Mr. Michael D. Powell the Radiation Safety Officer at NEOUCOM. Mr. Powell was the assistant RSO at NEOUCOM since spring of 1982 and is also the Institutional Safety Officer.

Attached you will find a summary of his training and experience, as well as a detailed response to the 25 criteria outlined in the NRC Draft Regulatory Guide on **"Qualifications For The RSO In A Large-Scale Non-Fuel-Cycle Radionuclide Program"**. This information is identical to that submitted for the license amendment.

We have also included the training and experience of our current authorized users. All future authorized users will submit the same information to the RSO. The RSO will either accept the credentials as sufficient experience to carry out the desired work, or will outline additional steps to be taken before granting authorization.

Formal Training in Radiation Safety

Michael D. Powell
Assistant Radiation Safety Officer

	Where Trained (Person of Institution)	Duration of Training	Dates of Training
Principles and practices of radiation protection.	National Institutes of Health	1 day	4/1/82
	Kent State University / NEOUCOM	1 semester	9/82-12/82
Radioactivity measurement standardization and monitoring techniques and instruments.	Kent State University	1 semester	9/82-12/82
	NEOUCOM	4/82 to present	
Mathematics and calculations basic to the use and measurement of radioactivity.	Kent State University	1 semester	9/82-12/82
	NEOUCOM	4/82 to present	
Biological effects of radiation	Kent State University	1 semester	9/82-12/82
	NEOUCOM	4/82 to present	

Additional training and workshops

Radioactive Wastes and Regulatory Compliance Workshop	Washington, D.C. Sponsored by Nuclear Energy Waste Management Consultants and US Ecology	3 days	8/82
Packaging and Transportation of Radioactive Waste Materials	Philadelphia, PA Sponsored by US Ecology	3 days	9/83
All-Ohio Safety Congress and Exibit	Columbus, Ohio Sponsored by the Ohio Department of Health	3 days	4/84
Midwest Workshop on Low Level Radioactive Waste Management: LLW Management In Transition	Columbus, Ohio Sponsored by ERM Midwest, Inc., and Ohio Department of Health	3 days	5/84
Occupational Safety Management	Chicago, Illinois Sponsored by National Safety Council	5 days	6/84

Northeastern Ohio
Universities
COLLEGE OF MEDICINE

Rootstown, Ohio 44272 Phone: 216-325-2511

6/18/84

B. J. Holt
Region III Licensing Section
Material Licensing Branch
Division of Fuel Cycle and Material Safety

Dear Ms. Holt,

I have prepared the following in response to the 25 characteristics outlined in appendix A of the NRC draft regulatory guide on "Qualifications for the RSO in a Large-Scale Non-Fuel-Cycle Radionuclide Program. Although the Northeastern Ohio Universities College of Medicine has a specific license and relatively non-flexible program, I feel that I can meet your qualifications for a broad license flexible program outlined in appendix A.

Since 1977, I have held several technical and administrative positions at the NEOUCOM. I am currently performing four main duties: Histology Laboratory Supervisor, Institutional Safety Offcier, Assistant Radiation Safety Officer, and Instructor of Microscopic Anatomy. I spend approximately 20-40% of my time supervising the histology laboratory and teaching Microscopic Anatomy. The remainder of my time is spent on safety related issues, occupational as well as radiation safety. Since becomming involved with the Radiation Safety Program in spring of 1982, I have spent a great deal of my time studying for this position.

APPENDIX A

1) Ability to communicate clearly, both verbally and in writing.

The various positions I hold at the NEOUCOM all demand strong communication skills. I continually interact with administrative officers, faculty members, staff employees, graduate students, and medical students. I am a member of several NEOUCOM committees and have held office as both a trustee and secretary of the Electron Microscopy Society of Northeastern Ohio.

2) Knowledge of mathematics, physics, chemistry, and biology ...

I currently hold a B.A. in Biology from the State University College at Buffalo, New York. My coursework included Calculus, Statistics, Inorganic and Organic Chemistry, Physics, Astronomy, Oceanography, Anthropology, Ecology, Philosophy, Sociology, and English, as well as numerous Biology Courses. I am nearing completion on an M.S. in Cell Biology from Kent State University. My coursework to date has included Electron Microscopy, Radiation Safety, Molecular

Genetics, Cell Biology, Microscopic Anatomy, Bioenergetics, and Biological Instrumentation.

3) Knowledge of current standards, guides, and reports ...

NEOUCOM's library and Radiation Safety Office contain information from numerous sources on Radiation and General Occupational Safety. I have spent a great deal of time researching this material and studying current and recommended safety practices. I have also visited and communicated with several regional universities to examine their radiation safety programs, and evaluate our own accordingly.

4) Knowledge of applicable NRC regulations, regulatory guides, ...

I believe that this is one of my strongest qualifications, and an area where I have contributed the most to NEOUCOM's present radiation safety program. The Radiation Safety Office maintains copies of all applicable NRC and DOT regulations, guides, and reports on file at all times. I have attended several workshops on regulatory compliance and radioactive waste disposal during the past two years, and anticipate continued attendance at similiar events in the future.

5) Knowledge and ability sufficient to operate instruments ...

I am knowledgable in the use and interpretation of all of the equipment listed in item #1. I was also instrumental in evaluating the equipment present in 1982, and purchasing new equipment to cover areas insufficiently monitored.

6) Knowledge and ability sufficient to perform calibrations ...

Although I routinely check the calibration of all radiation safety instruments with 137-Cs check sources, all equipment is recalibrated by the original vendor on an annual basis.

7) Knowledge and ability sufficient to select instruments ...

Most of the equipment listed in item #1 was purchased by the college prior to 1982, when Dr. Heath and I took over the program. An evaluation at that time revealed the need for meters specificly capable of efficiently detecting 125-I. I compared various types of equipment and finally purchased the Victoreen model #490 Thyac III survey meter with #425-110 scintillation probe. I have also just recently purchased (not yet received) two Minimonitor 125 Contamination Monitors from Atomic Products Corporation. These monitors are capible of detecting 0.002 uCi 125-I surface contamination.

8) Knowledge and ability sufficient to evaluate the need for shielding ...

I was responsible for designing and building numerous new shielding devices for several investigators laboratories. Although all of these devices were built from conventional plexiglass or lead, or combinations of both, I am familiar with many of the more modern composit materials (borated polyethylene, lead polyethylene, lithium polyethylene, boro-silicone, acryl-lead) and their individual specific applications.

9) Knowledge and ability sufficient to calculate radioactive decay ...

I have covered most of the calculations relating to radioactive materials and radiation safety in Dr. Heath's and NIH radiation safety courses. My working experience at NEOUCOM has given me ample opportunity to perform various calculations on a frequent basis. The only calculations I have not routinely performed to date are secular and transient equilibrium equations, although I fully understand their applications and can perform their calculation when necessary.

10) Knowledge and ability sufficient to calculate radiation doses.

Dr. Heath's radiation safety course and NEOUCOM's on the job training have involved calculations of various types of external doses. Although my internal dose calculations to date have been limited to bioassay measurements for 3-H, 125-I,and 131-I, NEOUCOM's radiation safety office and library contain numerous health physics books outlining necessary calculations in detail.

11) Knowledge of personnel monitoring devices and the ability to select ...

NEOUCOM contracts with R. S. Landauer, Jr. & Company for a complete monthly film badge service. Landauer offers a wide selection of badge types for varying applications.

12) Knowledge and ability sufficient to manage or conduct a training program.

To date, Dr. Heath has conducted a formal course in radiation safety at Kent State University. The majority of users have taken his course before working with radioisotopes at NEOUCOM. He will continue to offer this course on an annual basis. Additionally, beginning in July of this year, Dr. Kenneth Rosenthal, chairman of the Radiation Safety Committee, and I will be conducting in house training programs for all new users. We will also be holding in house workshops to update all present users and ancillary staff personnel. Attendance at these workshops will be manditory.

13) Knowledge and ability sufficient to recognize and anticipate problems ...

Since joining the safety programs in spring of 1982, I have been instrumental in identifying and correcting several problem areas within the college dealing with both radiation and general occupational safety. I am a member of both the General Safety and Radiation Safety Committees, and work closely with NEOUCOM's administration in dealing with these issues.

14) Knowledge and ability sufficient to recognize criticality problems ...

Although criticality problems are not applicable to our program due to the radioisotopes presently being used, I have had some specific training at workshops in dealing with this issue.

15) Knowledge of current radioactive effluent treatment methods, equipment ...

I believe I am very knowledgable in this area. The workshops offered by Nuclear Energy Waste Management Consultants, US Ecology, and ERM Midwest, have had sessions devoted entirely to this subject.

16) Knowledge and ability to recognize and control contamination ...

Since May of 1982, I have been responsible for all laboratory and personnel monitoring at NEOUCOM. This responsibility entails the identification of contamination problems as well as supervising, and when necessary, performing decontamination procedures.

17) Knowledge and ability sufficient to prepare an emergency plan ...

Dr. Heath, the Radiation Safety Committee, and I worked together in developing NEOUCOM's present emergency procedures. These procedures utilize the principle investigator, the Radiation Safety Office and Committee, the Security Office, and if necessary, the Health Physics department at Robinson Memorial Hospital (Ravenna, Ohio; about 5 miles away).

18) Knowledge and ability to evaluate, select, and use respiratory ...

To date, routine use of respiratory equipment has rarely been needed due to the levels of radionuclides used and the laboratories and hoods they are restricted to. The college does possess several types of respirators which are available if needed; half facepiece, full facepiece, and pressure demand full facepiece respirators. I also recently attended a special respiratory protection workshop given by MSA Company at the All Ohio Safety Congress in Columbus, Ohio.

19) Knowledge and ability to evaluate, select and use protective clothing ...

I believe I am very knowledgable in the selection and use of protective clothing not only for radioactive materials but also for carcinogenic and viral biohazards in general.

20) Knowledge and ability sufficient to evaluate, use ... gloveboxes and hoods.

One of the first needs I addressed in 1982 was the refurbishing of the glovebox and hood in the iodination laboratory. As Institutional Safety Officer and Assistant RSO, I continually monitor and evaluate all hoods and associated procedures at NEOUCOM, radiologic as well as biohazards. I am currently working with the Vice Provost and Buildings and Grounds Superintendent on the purchase of several new hoods for particular labs.

21) Knowledge and ability sufficient to evaluate and test sealed sources ...

We currently have a very small inventory of sealed sources, mostly beta and gamma counting standards. We have one 63-Ni sealed sourse in a detector for an HPLC unit. All sealed sources are wipe tested at 6 month intervals.

22) Knowledge and ability to evaluate and dispose of radioactive waste ...

This is the area where I have had the most training. The majority of the workshops I have attended dealt with radioactive waste, waste management, regulatory compliance, and waste disposal. I have personally handled all radioactive waste collection, packaging, decay, and disposal since May 1982. The NEOUCOM is also a member of ORMUG (Ohio Radioactive Materials User's Group) which was instrumental in political efforts to get Ohio to join the Midwest

Interstate Compact.

23) Working knowledge of transport regulations and requirements ...

The workshops which were sponsored by Nuclear Energy Waste Management Consultants and US Ecology covered all applicable DOT regulations in considerable detail. The Radiation Safety Office also has a current copy of 49 CFR 100-199 on file.

24) Knowledge and ability sufficient to conduct a bioassay program.

I personally developed and instituted our present 125-I and 131-I bioassay program after discussions with Dr. Heath, the NRC, and Radiation Safety Officers at several regional universities. We also conduct 3-H bioassays in accordance with the conditions outlined in NRC regulatory guides.

25) Knowledge and ability sufficient to manage effectively the applicant's radiation safety program.

Dr. Heath and I took over the radiation safety program in spring of 1982. Since that time, I have spent approximately 20-30 hours per week of my time on radiation safety. Dr. Heath's involvement has been centered around the initial overhall and organization of the program, as well as the supervision of the safety office. I have undeniably been the actual individual responsible for the day to day working of the radiation safety program, and the contact person faculty and staff are accustomed to working with. I believe I am very qualified to handle our particular program, and have the full support of NEOUCOM's administration and safety committees. I would be happy to furnish you with any other materials deemed necessary to reach your decision.

Respectfully submitted,

Michael D. Powell

Hutterer, F.

Hutterer, F.

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and practices of radiation protection	Columbia University	9/59 - 7/60	Yes	Yes
b. Radioactivity measurement standardization and monitoring techniques and instruments	Columbia University	9/59 - 7/60	Yes	Yes
c. Mathematics and calculations basic to the use and measurement of radioactivity	Columbia University	9/59 - 7/60	Yes	Yes
d. Biological effects of radiation	Columbia University * 175 hours with Drs. Eeitelbert, Quimby)	9/59 - 7/60	Yes	Yes

9. EXPERIENCE WITH RADIATION

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
SEE	6A & 6B	Mount Sinai Hospital Mount Sinai School of Medicine

DURATION OF EXPERIENCE	TYPE OF USE
Mount Sinai - 1963 - 1975	Biochemical and Animal Experiments

Depew, R.

Depew, R.

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and practices of radiation protection	University of Chicago, Department of Biophysics	6 yrs.	Yes	
b. Radioactivity measurement standardization and monitoring techniques and instruments			Yes	
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes	
d. Biological effects of radiation			Yes	

9. EXPERIENCE WITH RADIATION

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
^{32}P	60m Ci	University of Chicago, Department of Biophysics
^{3}H	20m Ci	
^{14}C	10m Ci	

DURATION OF EXPERIENCE	TYPE OF USE
University of Chicago - 6 yrs.	Labeling nucleic acids and proteins in bacterial cultures (and phage infected cells)

Truitt, E.B.

Truitt, E.B.

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and practices of radiation protection	Battelle Memorial Institute George Washington University	8 yrs.	Yes	
b. Radioactivity measurement standardization and monitoring techniques and instruments	Ibid			
c. Mathematics and calculations basic to the use and measurement of radioactivity	Ibid			
d. Biological effects of radiation	Ibid			

9. EXPERIENCE WITH RADIATION

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
H^3	100 µC	Battelle Memorial Institute & George Washington University
C^{14}	100 µC	Battelle Memorial Institute & George Washington University

DURATION OF EXPERIENCE	TYPE OF USE
Battell & George Washington - 8 yrs.	Metabolism experiments

Steggles, A.

Steggles, A.

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and practices of radiation protection	Imperial Cancer Research Fund London University National Institutes of Health	1962 - 1970 1964 1972 - 1976	Yes Yes	 Yes Yes
b. Radioactivity measurement standardization and monitoring techniques and instruments	Ibid 8a.)		Yes	Yes
c. Mathematics and calculations basic to the use and measurement of radioactivity	University of London Ibid 8a.)	1964	 Yes	Yes
d. Biological effects of radiation	University of London Ibid 8a.)	1964	 Yes	Yes

9. EXPERIENCE WITH RADIATION

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
Tritium	10 m Ci	England & USA
^{32}P	5 m Ci	USA

DURATION OF EXPERIENCE	TYPE OF USE
Tritium - 14 yrs. (1962-1976)	Macromolecule systhesis measurements
^{32}P - 4 yrs. (1972-1976)	Synthesis of RNA and DNA

Seide-Kehoe, R.

Seide-Kehoe, R.

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and practices of radiation protection	Rockefeller University	1 month	Yes	Yes
b. Radioactivity measurement standardization and monitoring techniques and instruments				
c. Mathematics and calculations basic to the use and measurement of radioactivity				
d. Biological effects of radiation				

9. EXPERIENCE WITH RADIATION

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
^{125}I	10 m Ci	Rockefeller University & Mount Sinai School of Medicine
^{32}P	10 m Ci	Mount Sinai School of Medicine
^{35}S, ^{3}H, ^{14}C	1-5 m Ci	Rockefeller University & Mount Sinai School of Medicine

DURATION OF EXPERIENCE	TYPE OF USE
^{125}I - 7 yrs.	Radioimmunoassay
^{32}P - 2½ yrs.	Nucleic acid labeling
^{35}S, ^{3}H, ^{14}C - 5 yrs.	Protein and nucleic acid labeling

Koo, P.

Koo, P.

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and practices of radiation protection	University of Maryland	2 wks.	Yes	Yes
b. Radioactivity measurement standardization and monitoring techniques and instruments				
c. Mathematics and calculations basic to the use and measurement of radioactivity				
d. Biological effects of radiation				

9. EXPERIENCE WITH RADIATION

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
C^{14}	1 m Ci	University of Maryland & Johns Hopkins University
I^{125}	3 m Ci	Johns Hopkins University
H^{3}	2 m Ci	Johns Hopkins University
Cr^{51}	1 m Ci	Johns Hopkins University

DURATION OF EXPERIENCE	TYPE OF USE
University of Maryland, Johns Hopkins (C^{14}) -12 yrs.	Chemical synthesis, protein modification
Johns Hopkins (I^{125}) -5 yrs.	Iodination of proteins, incorporated into nucleotides
Johns Hopkins (H^{3}) -7 yrs.	Incorporation into nucleotides
Johns Hopkins (Cr^{51}) -2 yrs.	Labeling of cells

Kehoe, J.M.

Kehoe, J.M.

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and practices of radiation protection	Cornell University	5 months		Yes
b. Radioactivity measurement standardization and monitoring techniques and instruments	Cornell University	5 months		
c. Mathematics and calculations basic to the use and measurement of radioactivity	Cornell University	5 months		
d. Biological effects of radiation	Cornell University	5 months		

9. EXPERIENCE WITH RADIATION

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
^{14}C ^{3}H ^{32}P	millicurie range	Cornell University Walter Reed Institute of Research Mount Sinai Medical Center

DURATION OF EXPERIENCE	TYPE OF USE
Cornell - 2 yrs. Walter Reed - 2 yrs. Mount Sinai - 7 yrs.	Biochemical Research Protein labeling

Finkelstein, J.

Finkelstein, J.

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURS
a. Principles and practices of radiation protection	Johns Hopkins University School of Hygienic and Public Health	24 hours		Yes
b. Radioactivity measurement standardization and monitoring techniques and instruments				
c. Mathematics and calculations basic to the use and measurement of radioactivity				
d. Biological effects of radiation				

9. EXPERIENCE WITH RADIATION

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
^{3}H	10m Ci	University of Wisconsin
^{3}H	10m Ci	Johns Hopkins Medical School

DURATION OF EXPERIENCE	TYPE OF USE
University of Wisconsin - 2 yrs.	Whole animal
Johns Hopkins - 3 yrs.	Autoradiography

Name of investigator MICHAEL MARON, PhD

TRAINING AND EXPERIENCE OF INDIVIDUAL NAMED

TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FOR[MAL] COU[RSE]
a. Principles and practices of radiation protection.	NEOUCOM U.C. Santa Barbara	Semester Course 1 YR	X	X
b. Radioactivity measurement and monitoring techniques and instrumentation.	NEOUCOM U.C. Santa Barbara	Semester 1 YR	X	X
c. Mathemetics and calculations basic to the use and measurement of radioactivity.	NEOUCOM UC Santa Barbara	Semester 1 YR	X	X
d. Biological effects of radiation.	NEOUCOM UC Santa Barbara	Semester 1 YR	X	X

EXPERIENCE WITH RADIOACTIVE MATERIALS

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
^{3}H		U.C. Santa Barbara

DURATION OF EXPERIENCE	TYPE OF USE (e.g. chemical synthesis,e
U.C. Santa Barbara - 1 YEAR	RIA for cortisol, liquid scintillation

Name of investigator Dr. Jann A. Nielsen

TRAINING AND EXPERIENCE OF INDIVIDUAL NAMED

.TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
. Principles and ractices of radiaion protection.	University of Minnesota		3 years	
. Radioactivity easurement and onitoring techniucs and instrumenation.	University of Minnesota		3 years	
. Mathemetics and alculations basic o the use and easurement of adioactivity.	University of Minnesota		3 years	
. Biological ffects of adiation.	University of Minnesota		3 years	

. EXPERIENCE WITH RADIOACTIVE MATERIALS

SOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
3 - H	1.000 mCi	University of Minnesota
14 - C	0.010 mCi	University of Minnesota
45 - Ca	0.010 mCi	University of Minnesota

DURATION OF EXPERIENCE	TYPE OF USE (e.g. chemical synthesis,etc.)
Three Years	Biogenic amine metabolism

Name of investigator John Y. L. Chiang, PhD

Associate Professor, NEOUCOM

TRAINING AND EXPERIENCE OF INDIVIDUAL NAMED

.TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
. Principles and ractices of radiaion protection.	Northeastern Ohio Universities College of Medicine (NEOUCOM)	1 week	x	
. Radioactivity easurement and onitoring techniues and instrumenation.	State University of New York, Albany	2 years	x	
. Mathemetics and alculations basic o the use and easurement of adioactivity.	SUNY - Albany	2 years	x	
. Biological ffects of adiation.	NEOUCOM	1 week	x	

. EXPERIENCE WITH RADIOACTIVE MATERIALS

SOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
14-C	10 mCi	State University of New York at Albany
125-I	1 mCi	State University of New York at Albany

DURATION OF EXPERIENCE	TYPE OF USE (e.g. chemical synthesis,etc.)
Two Years	Labeling of enzymes with 125-I Tracing fate of 14-C labeled substrates

Name of investigator Theodore Voneida, Ph.D.

TRAINING AND EXPERIENCE OF INDIVIDUAL NAMED

.TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FOR COU
a. Principles and practices of radiation protection.	Northeastern Ohio Universities College of Medicine (NEOUCOM)	1 semester	x	x
b. Radioactivity measurement and monitoring techniques and instrumentation.	Case Western Reserve University (CWRU) NEOUCOM	8 years	x	
c. Mathemetics and calculations basic to the use and measurement of radioactivity.	NEOUCOM	1 semester		x
d. Biological effects of radiation.	NEOUCOM	3 years	x	x

EXPERIENCE WITH RADIOACTIVE MATERIALS

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
3 - H	10 mCi	CWRU and NEOUCOM

DURATION OF EXPERIENCE	TYPE OF USE (e.g. chemical synthesis,etc.)
8 years	Autoradiography of neurobiological tracing experiments.

TRAINING AND EXPERIENCE OF INDIVIDUALS NAMED ON NRC LICENSE, ITEM #6

NAME OF APPLICANT Tim Teyler DATE 7 May 85

I. TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and practices of radiation protection	NEOUCOM	2 mo		Dr. Metzger
b. Radioactivity measurement standardization and monitoring techniques and instruments				
c. Mathematics and calculations basic to the use and measurement of radioactivity	NEOUCOM	2 mo		"
d. Biological effects of radiation	NEOUCOM	2 mo		"

II. EXPERIENCE

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
^{32}P	incorporation into brain slice phosphoproteins.	Dept Biochemistry, Harvard Med
^{14}C, ^{3}H	Labelled amino acids incorporated into brain proteins/peptides in brain slices	" "
^{14}C, ^{3}H	2-deoxyglucose incorporation	Dept. Neurosurgery, U. Virginia Med. into rat CNS, autoradiography

DURATION OF EXPERIENCE	TYPE OF USE
Harvard - experience over a 2 year period, leading to 2 papers Virginia - over a 2 month period leading to 1 paper.	see above

TRAINING AND EXPERIENCE OF INDIVIDUALS NAMED ON NRC LICENSE, ITEM #6

NAME OF APPLICANT Kenneth S. Rosenthal DATE 10/79

I. TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and practices of radiation protection	Univ. of Delaware	20 hrs.		Yes
b. Radioactivity measurement standardization and monitoring techniques and instruments	Univ. of Illinois	6 hrs.	Yes	
c. Mathematics and calculations basic to the use and measurement of radioactivity	Harvard Medical School	2 hrs.		Yes
d. Biological effects of radiation				

II. EXPERIENCE

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED
^{3}H	5mCi	Univ. of Delaware, Illinois, Harvard
^{14}C	5mCi	Univ. of Delaware, Illinois, Harvard
^{32}P	50mCi	Univ. of Illinois
^{125}I	50mCi	Harvard
^{51}Cr	10mCi	Harvard

DURATION OF EXPERIENCE	TYPE OF USE
Univ. of Delaware - 1 year Univ. of Illinois - 4 years Harvard Med. - 2 years	Metabolic labelling of bacteria, cells, virus Radioiodination of protein. Cytotoxicity assays. Autoradiography.

ITEM #8 - **Training For Individuals Working In Or Frequenting Restricted Areas**

A. Authorized Users - Faculty

All faculty members who desire to use radioisotopes or other forms of ionizing radiation must provide the Radiation Safety Officer with a summary of their past training and experience in handling radioactive materials. The Radiation Safety Officer will either accept the credentials as sufficient or recommend additional procedures to follow before accepting him as an authorized investigator. Faculty members without previous documented experience must follow the procedures listed for Individual users.

B. Individual Users - Technical Staff, Students, Visiting Faculty

All must meet the following specific requirements before beginning work with radioactive materials. Past coursework or experience gained on the job will not exempt an individual from completing these requirements.

1. All must pass a written examination approved by the Radiation Safety Committee and administered by the Radiation Safety Officer. Individuals may attend one of the periodic radiation safety workshops, or study the materials on their own. The exam will cover the following topics:

    a. Fundamentals of Radiation Safety

        1. Characteristics of gamma and x-radiation
        2. Characteristics of beta and alpha particles
        3. Units of radiation dose and quantity
        4. Hazards of excessive exposure to radiation
        5. Levels of radiation from radiation sources
        6. Methods of controlling radiation dose
            a. Time
            b. Distance
            c. Shielding

    b. Radiation Detection Instrumentation

        1. Use of radiation survey instruments
            a. Operation
            b. Calibration
            c. Limitations
        2. Survey techniques
        3. Use of personnel monitoring equipment
            a. Film and ring badges
            b. Pocket dosimeters

    c. Mathematics and Calculations Basic to the Use of Radioactive Materials

d. NEOUCOM Radiation Safety Manual

e. US NRC Regulations - 10 CFR 19
10 CFR 20
Regulatory Guide 8.13

In addition, NEOUCOM's library contains several very informative video tapes and films on Radiation, Radiation Safety, Radioisotope Laboratory Techniques, and Emergency Procedures.

2. All individual users must work under the direct supervision of one of the authorized investigators.

C. Ancillary Personnel - Security, Cleaning, Maintenance, etc.

All ancillary personnel who may possibly enter laboratories containing radioactive materials will be briefed on current policies and procedures no less than once per year. Ancillary personnel are allowed to enter Minimum Quantity or Type C laboratories, but are not allowed access to Type B or Type A restricted areas such as the radioiodination laboratory or waste storage room.

EXCEPTIONS: Only those individuals who are listed on another NRC license as individuals who will use or supervise the use of licensed materials will be exempt from taking the exam.

ITEM #9 - **Facilities and Equipment**

NEOUCOM's facilities and equipment are outlined on the following pages. Radioactive materials areas will be categorized as Minimum Quantity, Type C, Type B, or Type A depending on various factors such as ventilation, shielding, equipment, and the proximity to unrestricted areas.

Attached are our proposed guidelines for the maximum allowable activities in NEOUCOM laboratories, a radiotoxicity classification system, and the required survey frequencies for corresponding areas. These guidelines are taken from those developed by the International Atomic Energy Agency.

GUIDELINES FOR MAXIMUM ACTIVITIES IN NEOUCOM LABORATORIES

Radiotoxicity Of Radionuclides	Minimum Significant Quantity	Type Of Working Laboratory Required		
		Type C	Type B	Type A
1) Very High	0.1 uCi	< 10 uCi	10 uCi - 10 mCi	> 10 mCi
2) High	1.0 uCi	<100 uCi	100 uCi - 100 mCi	>100 mCi
3) Moderate	10 uCi	< 1 mCi	1 mCi - 1 Ci	> 1 Ci
4) Low	0.1 mCi	< 10 mCi	10 mCi - 10 Ci	> 10 Ci

Type A is a specially designed laboratory for handling large activities of highly radioactive materials. Type B is a specially designed radioisotope laboratory. Type C is a good quality chemical laboratory with adequate ventilation, fume hoods, and non-absorbent surfaces. With the approval of the Radiation Safety Officer, it may be possible to increase the upper limits for Type C laboratories towards those of Type B laboratories for toxicity clases 3 and 4. Laboratories without hoods may not work with amounts greater than the minimum significant quantities.

Modifying factors must be applied to the allowable quantities indicated according to the complexity of the procedures to be followed. The following factors are suggested but due regard must be paid to all circumstances affecting individual cases.

Procedure	Modifying Factor
Storage (stock solutions)	x 100
Very simple wet operations	x 10
Normal chemical operations	x 1
Complex wet operations with risk of spills	x 0.1
Simple dry operations	x 0.1
Volatile radioactive compounds	x 0.1
Exposure of non-occupational personnel	x 0.1
Dry and dusty operations	x 0.01

CLASSIFICATION OF RADIONUCLIDES ACCORDING TO RELATIVE RADIOTOXICITY

Class 1 - Very High Toxicity

^{90}Sr	^{90}Y	^{210}Pb	^{210}Bi

Class 2 - High Toxicity

^{22}Na	^{36}Cl	^{45}Ca	^{47}Ca	^{46}Sc	^{54}Mn	^{56}Co	^{59}Fe
^{60}Co	^{85}Sr	^{89}Sr	^{91}Y	^{95}Zr	^{106}Ru	^{106}Rh	$^{110}Ag^{m}$
$^{115}Cd^{m}$	$^{114}In^{m}$	^{124}Sb	^{125}Sb	$^{127}Te^{m}$	$^{129}Te^{m}$	^{124}I	^{125}I
^{126}I	^{131}I	^{133}I	^{134}Cs	^{137}Cs	^{140}Ba	^{144}Ce	^{144}Pr
^{151}Sm	^{152}Eu	^{154}Eu	^{160}Tb	^{170}Tm	^{181}Hf	^{182}Ta	^{192}Ir
^{203}Hg	^{204}Tl	^{207}Bi	^{210}Bi				

Class 3 - Moderate Toxicity

^{7}Be	^{14}C	^{18}F	^{24}Na	^{38}Cl	^{31}Si	^{32}P	^{35}S
^{41}A	^{42}K	^{43}K	^{47}Sc	^{48}Sc	^{48}V	^{51}Cr	^{52}Mn
^{56}Mn	^{52}Fe	^{55}Fe	^{59}Fe	^{57}Co	^{58}Co	^{63}Ni	^{65}Ni
^{64}Cu	^{65}Zn	$^{69}Zn^{m}$	^{72}Ga	^{73}As	^{74}As	^{76}As	^{77}As
^{75}Se	^{82}Br	$^{85}Kr^{m}$	^{87}Kr	^{86}Rb	^{91}Sr	^{90}Y	^{92}Y
^{93}Y	^{97}Zr	$^{92}Nb^{m}$	^{95}Nb	^{99}Mo	^{96}Tc	$^{97}Tc^{m}$	^{97}Tc
^{99}Tc	^{97}Ru	^{103}Ru	^{103}Pd	^{109}Pd	^{105}Ag	^{111}Ag	^{109}Cd
^{115}Cd	^{113}Sn	^{125}Sn	^{122}Sb	$^{125}Te^{m}$	^{127}Te	^{129}Te	$^{131}Te^{m}$
^{132}Te	^{130}I	^{132}I	^{134}I	^{135}I	^{135}Xe	^{131}Cs	^{136}Cs
^{131}Ba	^{140}La	^{141}Ce	^{143}Ce	^{142}Pr	^{143}Pr	^{147}Nd	^{149}Nd
^{147}Pm	^{149}Pm	^{153}Sm	^{152}Eu	^{155}Eu	^{153}Gd	^{159}Gd	^{165}Dy
^{166}Dy	^{166}Ho	^{169}Er	^{171}Er	^{171}Tm	^{175}Yb	^{177}Lu	^{181}W
^{185}W	^{187}W	^{183}Re	^{186}Re	^{188}Re	^{185}Os	^{191}Os	^{193}Os
^{190}Ir	^{194}Ir	^{191}Pt	^{193}Pt	^{197}Pt	^{196}Au	^{198}Au	^{199}Au
^{197}Hg	$^{197}Hg^{m}$	^{200}Tl	^{201}Tl	^{202}Tl	^{203}Pb	^{206}Bi	^{212}Bi

Class 4 - Low Toxicity

^{3}H	^{15}O	^{37}A	$^{58}Co^{m}$	^{59}Ni	^{69}Zn	^{71}Ge	^{85}Kr
^{87}Rb	$^{91}Y^{m}$	^{93}Zr	^{97}Nb	$^{96}Tc^{m}$	$^{99}Tc^{m}$	$^{103}Rh^{m}$	$^{113}In^{m}$
^{129}I	$^{131}Xe^{m}$	^{133}Xe	$^{134}Cs^{m}$	^{135}Cs	^{147}Sm	^{187}Re	$^{191}Os^{m}$
$^{193}Pt^{m}$	$^{197}Pt^{m}$						

Required Laboratory Survey Frequencies

Toxicity Class	Survey Frequency Category: LOW	MEDIUM	HIGH
1	< 10 uCi	10 uCi - 1 mCi	> 1 mCi
2	< 1 mCi	1 mCi - 100 mCi	> 100 mCi
3	<100 mCi	100 mCi - 10 Ci	> 10 Ci
4	< 10 Ci	10 Ci - 1000 Ci	>1000 Ci

Procedure	Modifying Factor
Simple Storage	x 100
Very simple wet operations	x 10
Normal chemical operations	x 1
Complex wet operations	x 0.1
Simple dry operations	x 0.1
Volatile radioactive compounds	x 0.1
Exposure of non-occupational personnel	x 0.1
Dry and dusty operations	x 0.01

The initial survey frequency must be multiplied by the appropriate modifying factor to determine the **required survey frequency.** Required frequencies are as follows:

LOW - Not less than once per month
MEDIUM - Not less than once per week
HIGH - Not less than once per normal working day

Maps of the NEOUCOM campus are shown on the following pages. All byproduct materials will be confined to approved laboratories in buildings C, D, E, or the Vivarium. Exceptions to this would include Shipping and Receiving, or the Security Office in the event of materials received after normal working hours.

Diagrams of current Type C, and Type B laboratories are indicated as follows:

Type C - Rooms C-105, D-123

Type B - Room C-125

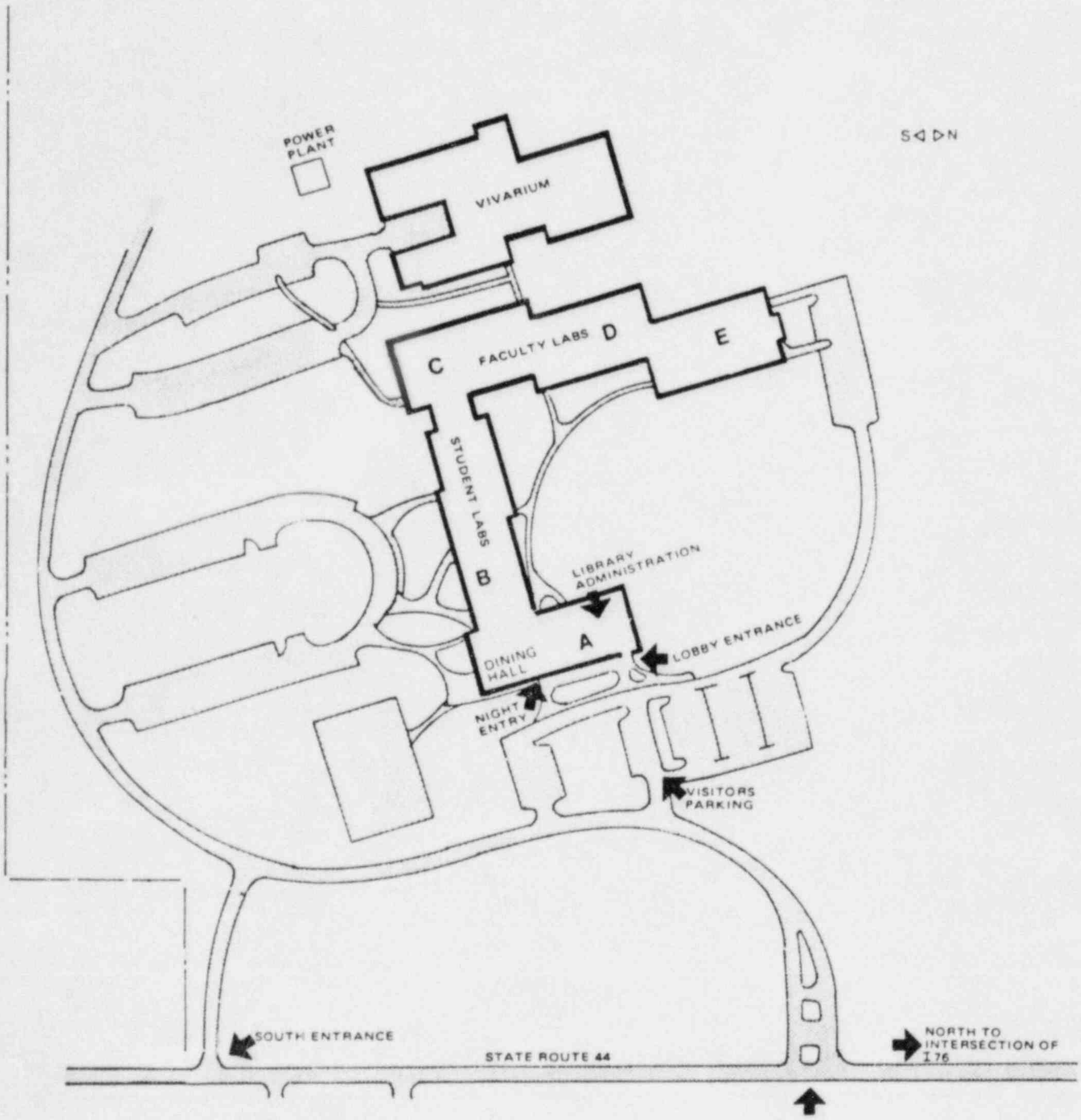
Diagrams of new facilities under construction in lower E wing are also shown. Room E-50 is completed and occupied. Rooms E-48 and E-46 are awaiting the installation of radioisotope fume hoods and bench tops. These facilities are planned for Type B work, with the capacity for Type A storage in E-46.

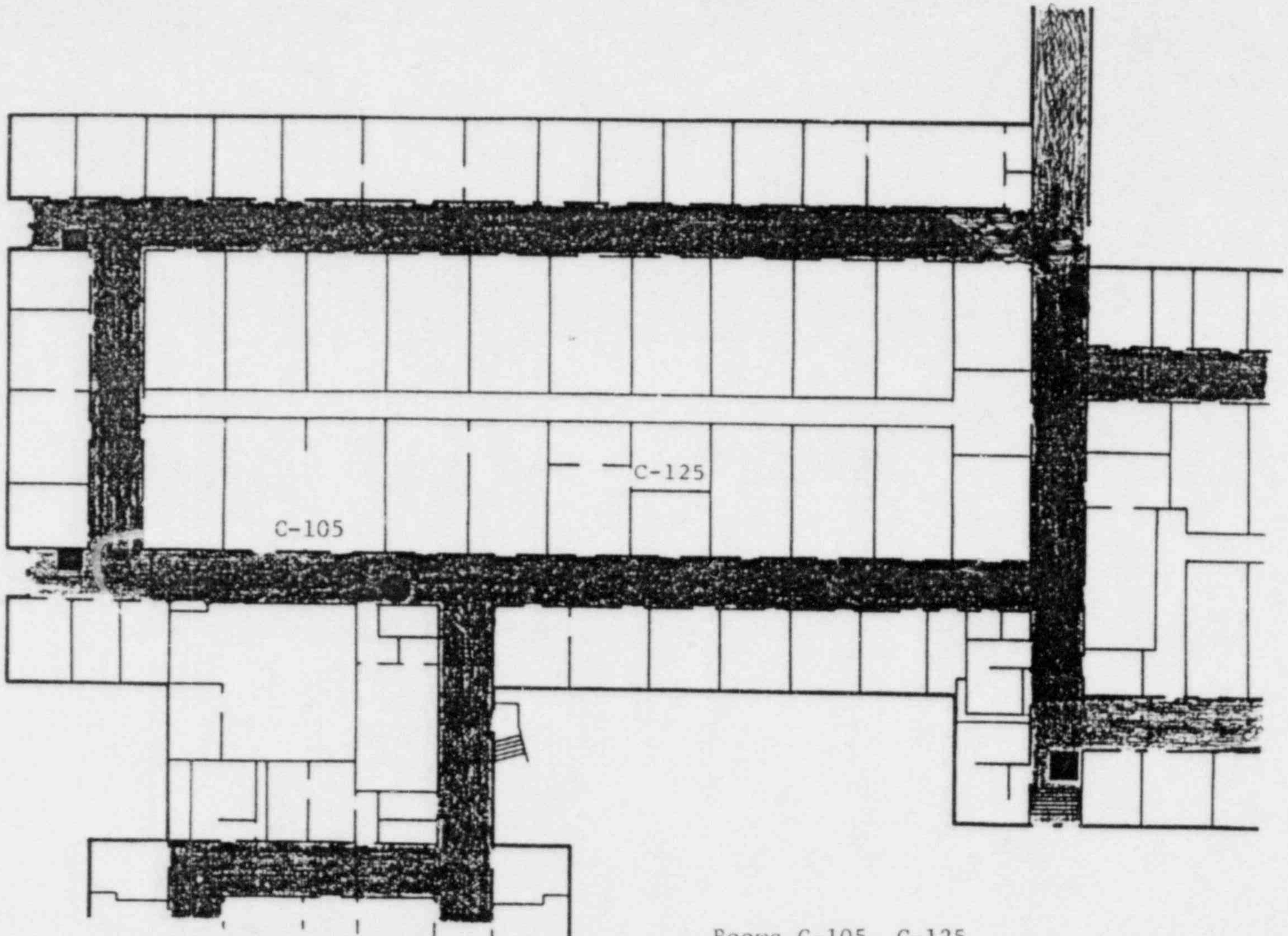
A diagram of our Receiving Area and Vivarium is also included.

Individual unit ventilators operate at approximately 1100 CFM. They are adjustable between 0-100% outside air, but are normally run at around 20% outside air. Unit ventilators and hoods are interconnected such that outside air increases during hood operation. Chemical and radioisotope fume hoods can exhaust between approximately 100 and 600 CFM depending on door position and model. The general exhaust system removes 80-90 CFM per room continuously.

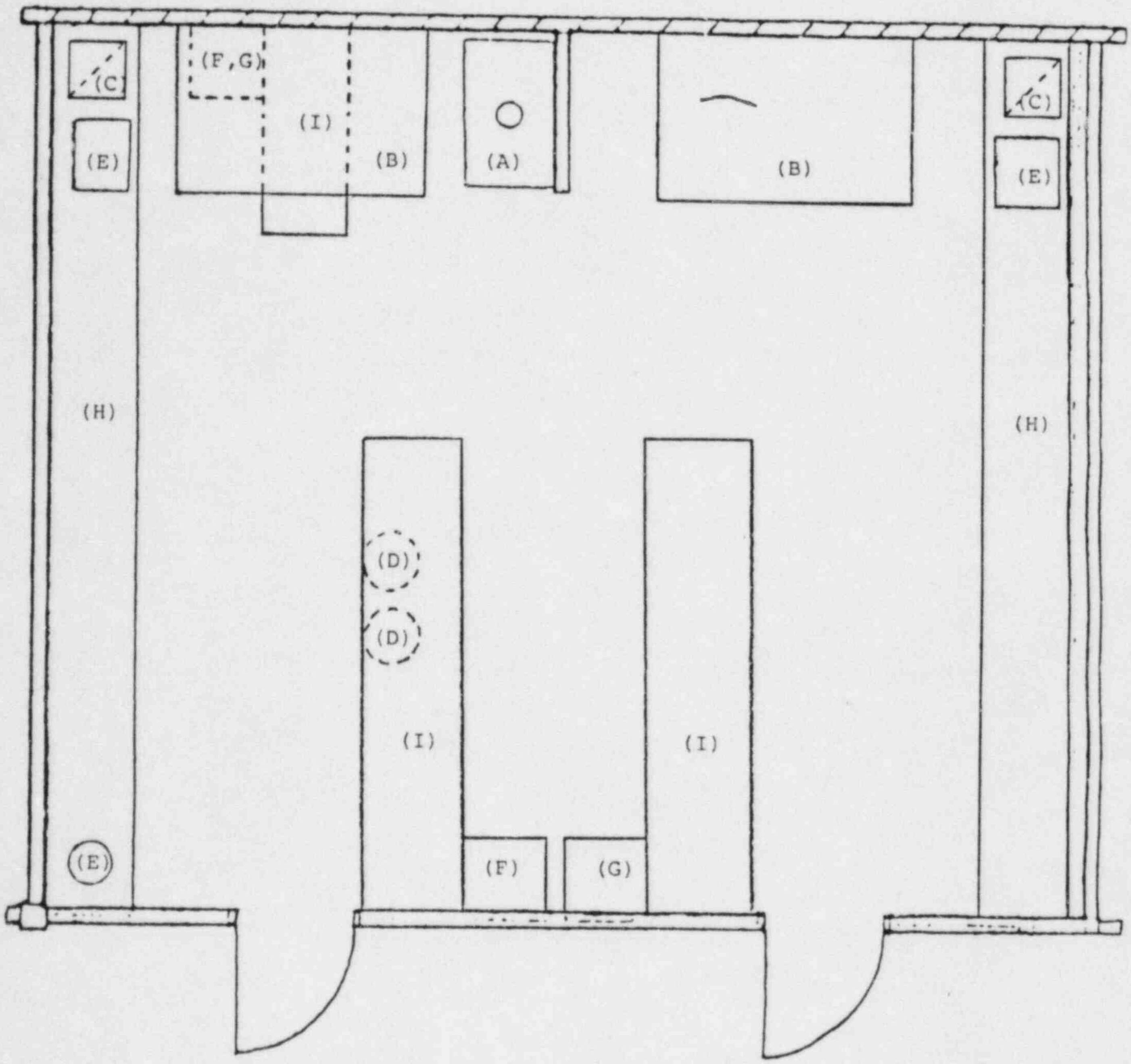
NORTHEASTERN OHIO UNIVERSITIES COLLEGE OF MEDICINE

4209 STATE ROUTE 44, ROOTSTOWN, OHIO 44272 PHONE (216) 325-2511, AKRON CALLS (LOCAL CHARGE) 678-4160





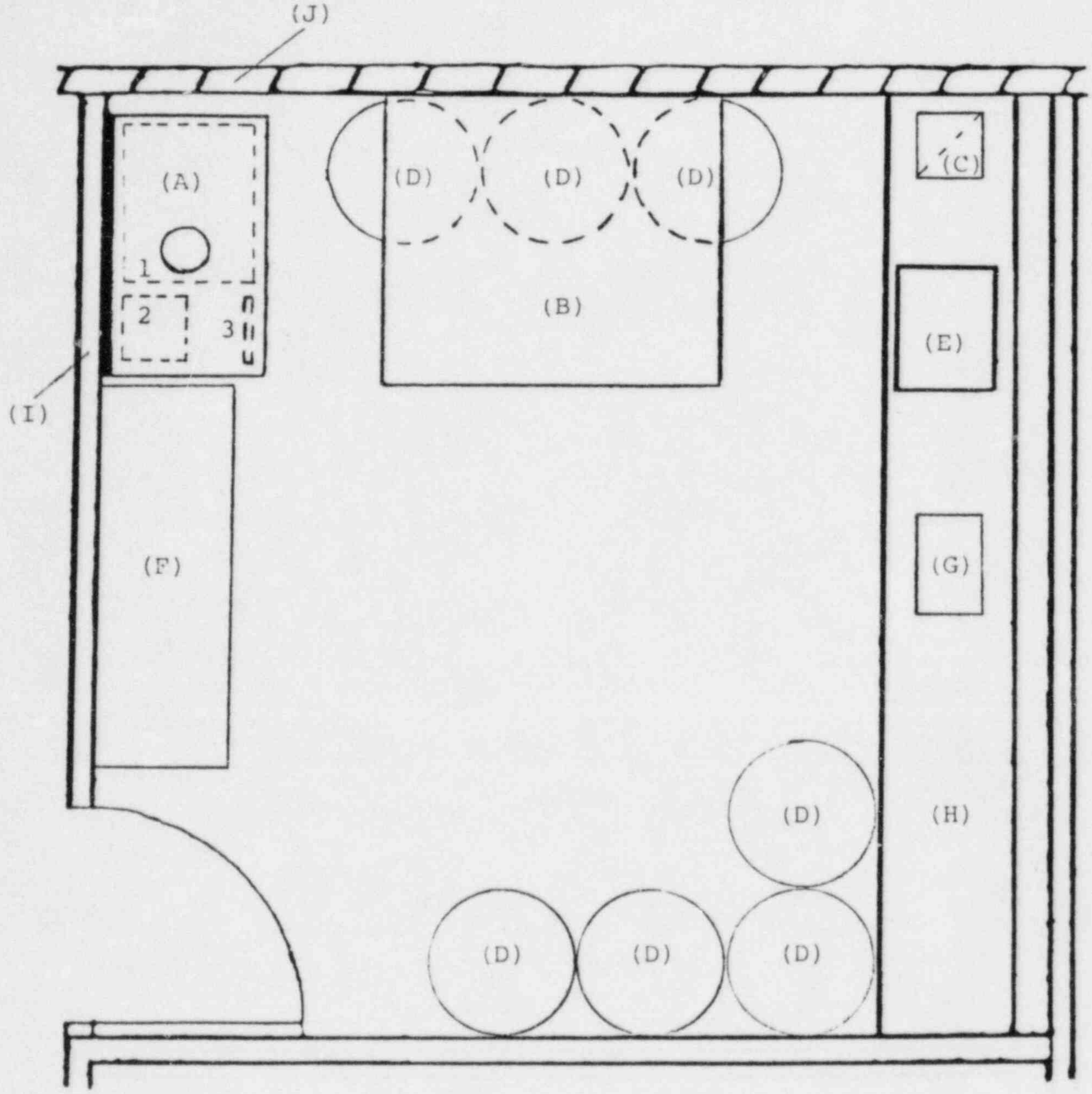
Rooms C-105, C-125



A - Chemical Fume Hood
B - Unit Ventilators
C - General Exhaust
D - Waste Drums
E - Sink

F - Freezer
G - Refrigerator
H - Chemical Resistant Bench Top
I - Tables

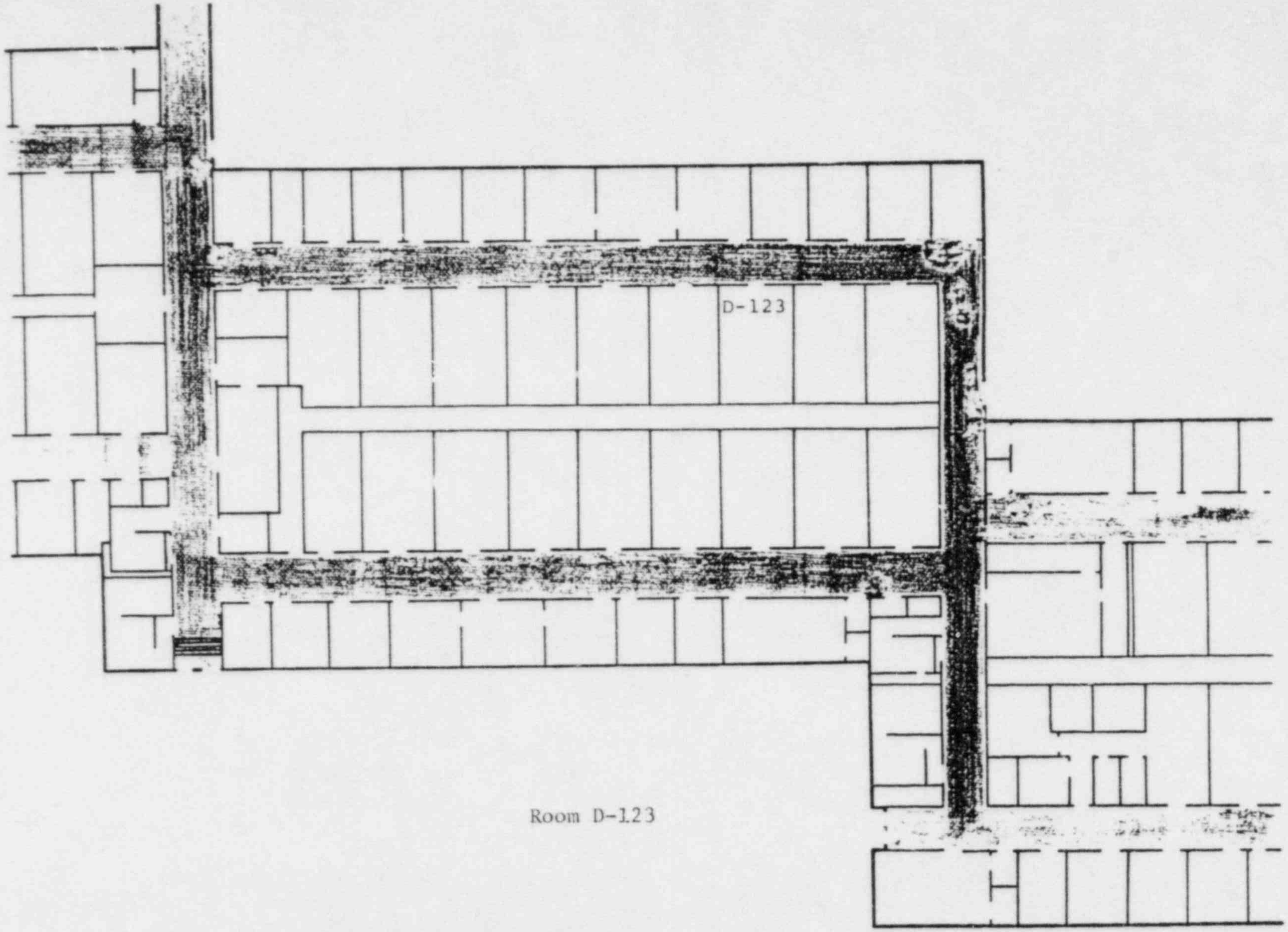
Room C-105



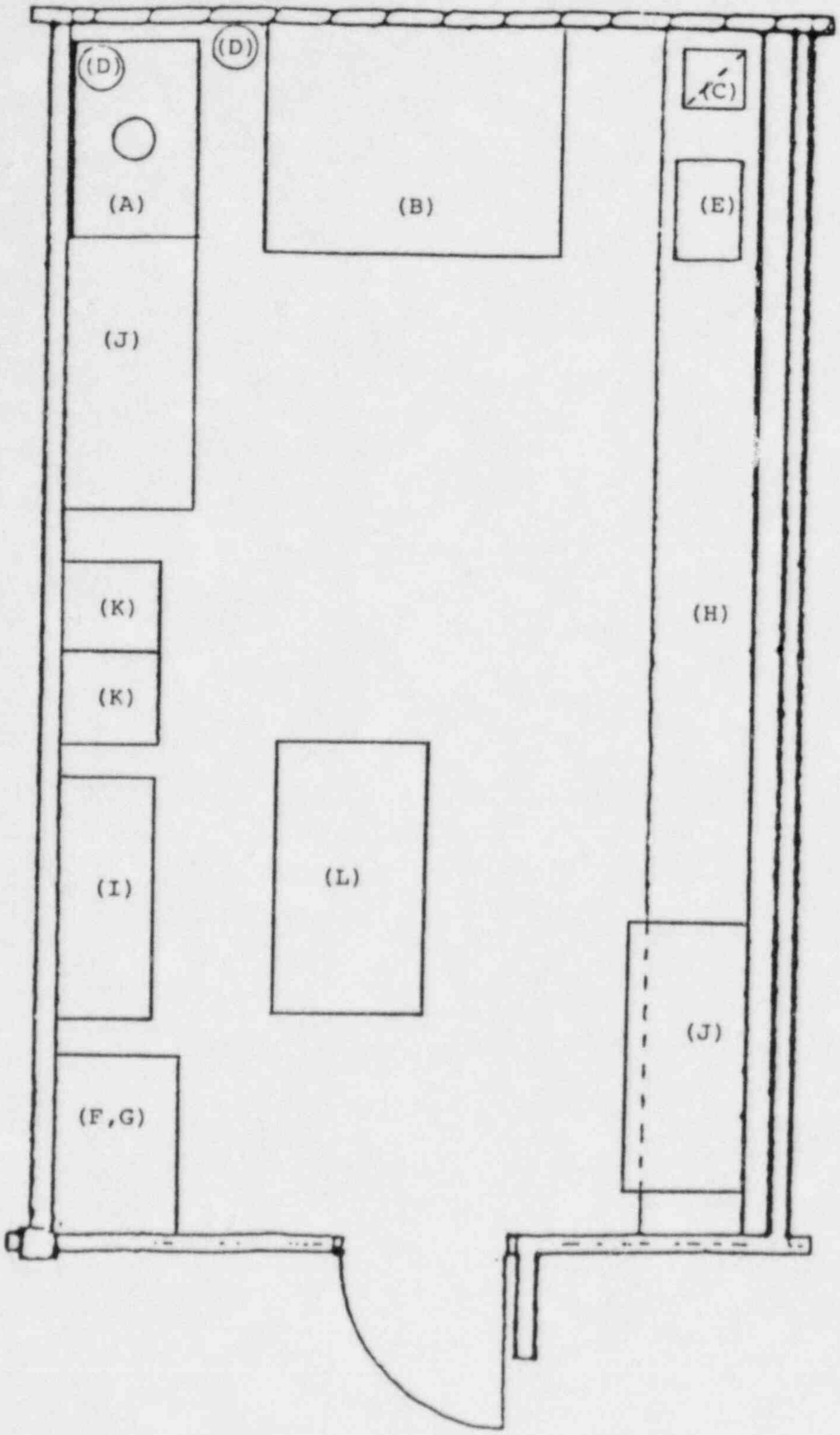
A - Radioisotope Fume Hood
A1- Glove Box with Charcoal Filter
A2- Lead Box
A3- Lead Shield
B - Unit Ventilator
C - General Exhaust
D - Waste Drums

E - Sink
F - Freezer
G - Lead Storage Area
H - Chemical Resistant Bench Top
I - Convential Drywall with 1/8 in. Lead
J - 8 in. Block Wall

Room C-125

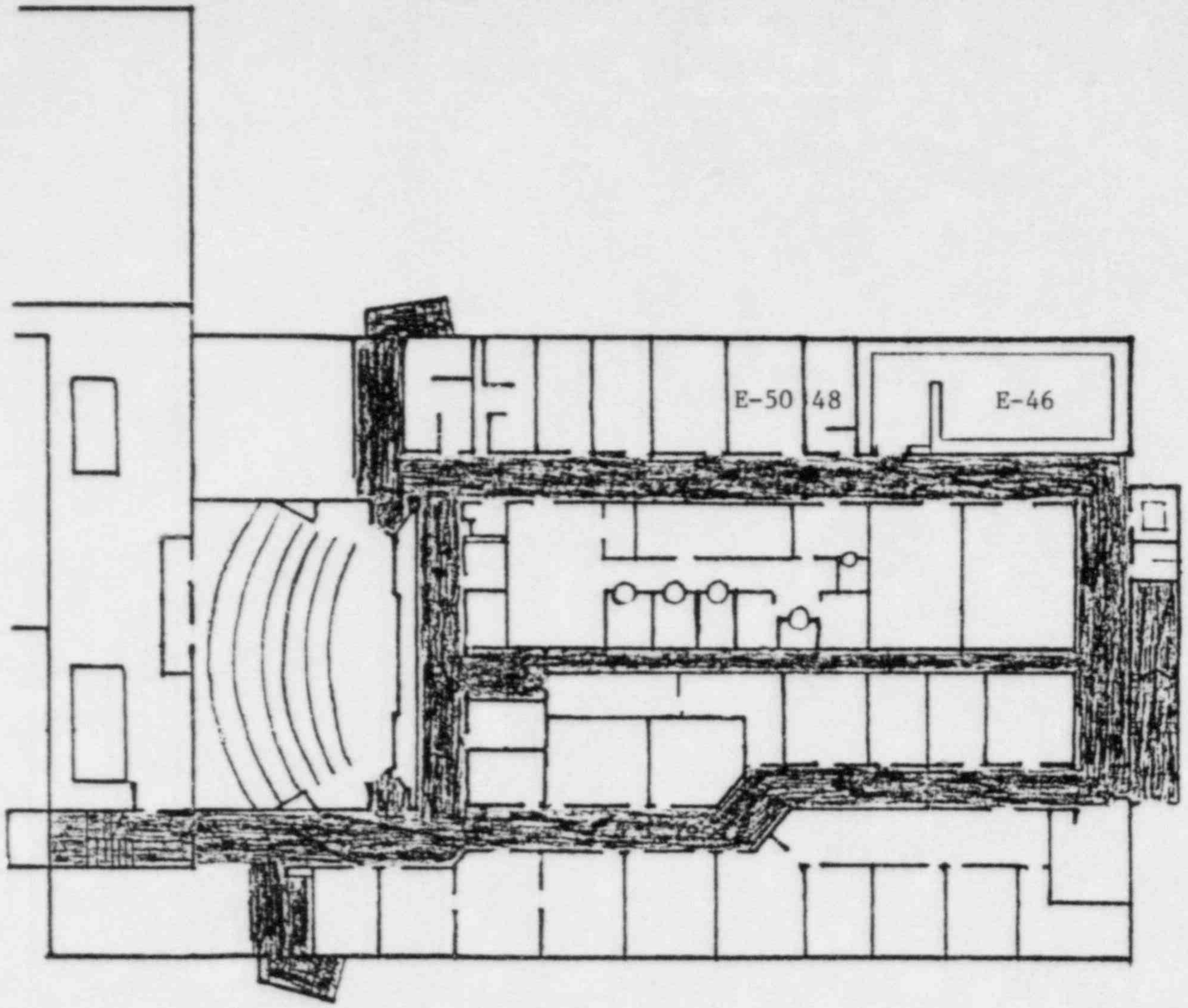


Room D-123

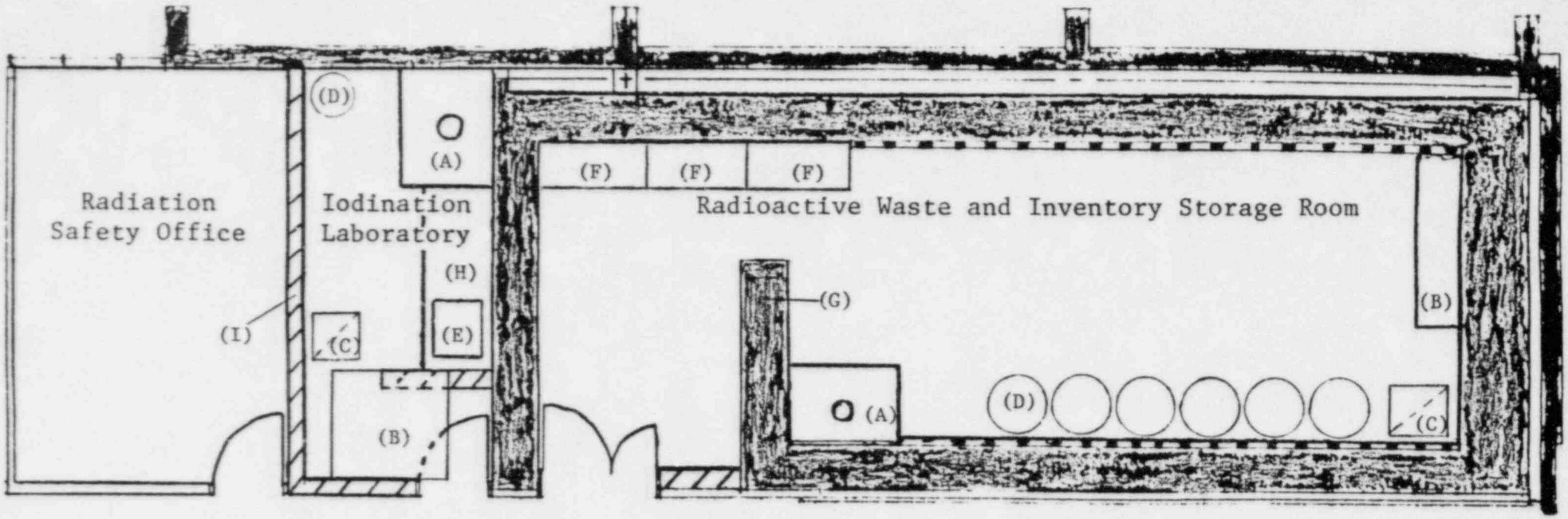


A - Chemical Fume Hood
B - Unit Ventilator
C - General Exhaust
D - Waste Containers
E - Sink
F - Freezer
G - Refrigerator
H - Chemical Resistant Bench Top
I - Table
J - Tissue Culture Hoods
K - Incubators
L - Desk

<u>Room D-123</u>

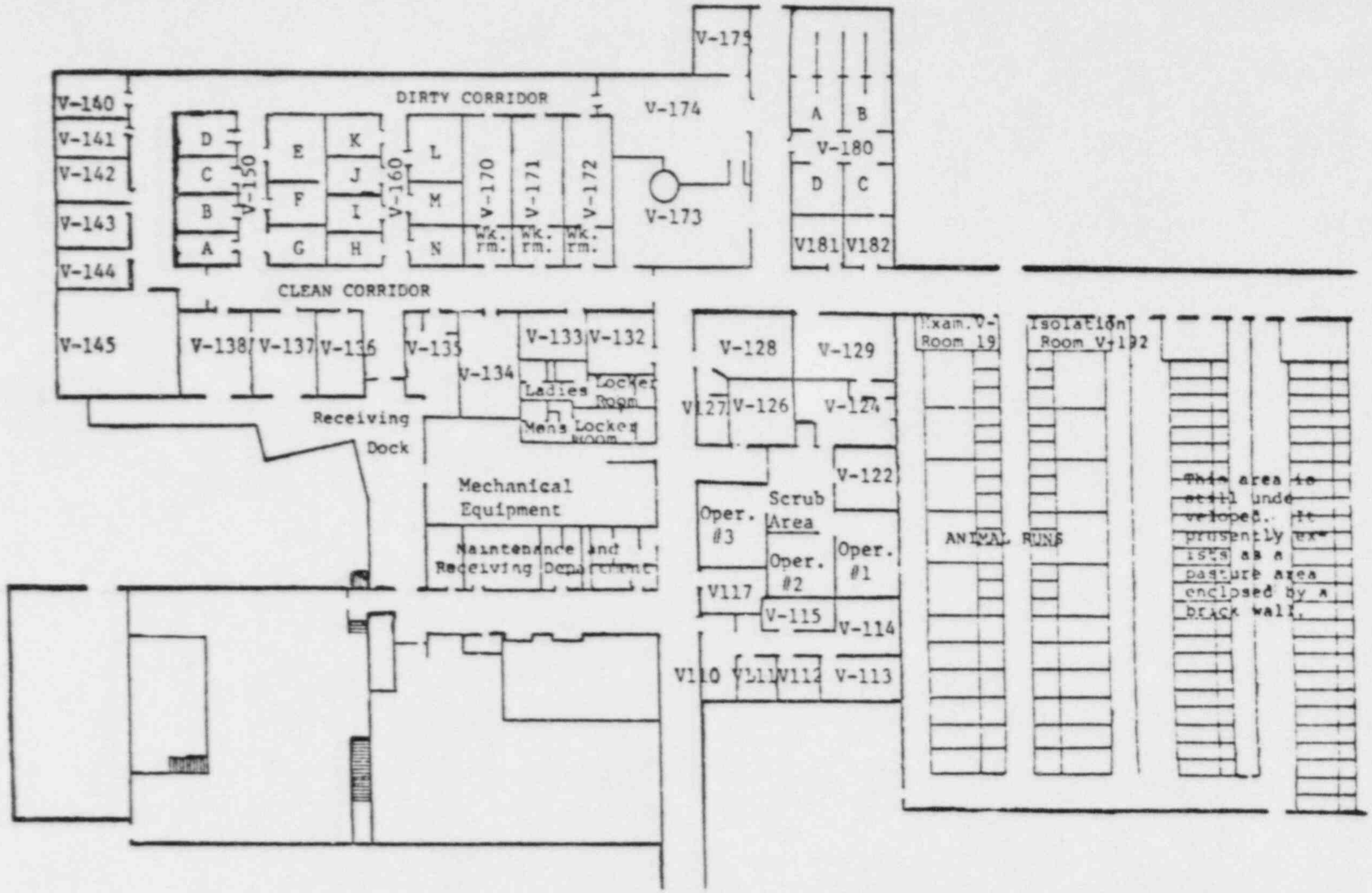


Rooms E-50, E-48, E-46



A - Radioisotope Fume Hood
B - Unit Ventilator
C - General Exhaust
D - Waste Drums
E - Sink
F - Cabinets and Shelves
G - 2 ft. Thick Reinforced Concrete Wall & Ceiling
H - Chemical Resistant Bench Top
I - 8 in. Thick Block Wall

Rooms E-50, E-48, E-46


DIRTY CORRIDOR
CLEAN CORRIDOR
V-140
V-141
V-142
V-143
V-144
V-145
V-150
V-160
V-170
V-171
V-172
V-173
V-174
V-175
V-180
V181
V182
V-138
V-137
V-136
V-135
V-134
V-133
V-132
V-128
V-129
V127
V-126
V-124
V-122
Ladies
Locker Room
Mens Locker Room
Receiving Dock
Mechanical Equipment
Maintenance and Receiving Department
Scrub Area
Oper. #3
Oper. #2
Oper. #1
V117
V-115
V-114
V110
V111
V112
V-113
Exam. V-Room 19
Isolation Room V-192
ANIMAL RUNS
Wk. rm.
This area is still undeveloped. It presently exists as a pasture area enclosed by a brick wall.

VIVARIUM

ITEM #10 - **Radiation Safety Program**

NEOUCOM'S radiation safety program is described in detail in our Radiation Safety Manual. This manual was recently revised and contains many changes necessary under the new Broad Scope license application. We desire permission to make the following future revisions as needed without prior notification of the NRC.

1) Changes dictated by NRC rule changes.
2) Changes in internal management forms.
3) Changes in contractors for waste disposal.
4) Changes in contractors for personnel dosimetry.
5) Changes in contractors for instrument calibration.
6) Changes in NEOUCOM Policies and Procedures, so long as the changes are in compliance with all NRC Rules and Regulations and preserve the strict ALARA principle.

Under the philosophy of the Type B Broad Scope license, the Radiation Safety Officer is now the head administrative authority of the safety program. All other previously existing administrative authorities have been removed from the chain of command. Authority flows from the NRC, to the RSO, to the authorized users. The Radiation Safety Committee operates in an advisory capacity to the RSO. The RSO is vested with the full authority to make the ultimate institutional decisions regarding all aspects of the safety program. The RSO's full duties and responsibilities are outlined in Section I of the safety manual.

A list of the Radiation Safety Office's currently available instruments and equipment is also included in Section I. All survey equipment will be recalibrated on an annual basis by an NRC authorized firm. We are currently utilizing Victoreen Inc.; Cleveland, Ohio; for this function. All instruments will be periodicly checked with a 137-Cs sealed source for comparison against readings taken immediatly after return of the newly recalibrated instrument.

Personnel to be covered in the radiation safety program are outlined below. Their training and responsibilities are outlined in Section II of the safety manual.

1) Authorized Users - Faculty

2) Individual Users - Visiting Faculty
Technical Staff
Post Doctoral Fellows
Graduate Students

3) Ancillary Workers - Security
Maintenance
Cleaning Crew

4) Non-Occupational - Secretaries
Medical Students
Technical Staff
General Public

NEOUCOM's personnel and laboratory monitoring programs are described in Section III of the safety manual. Tables are included showing the conditions requiring bioassay, and the minimum laboratory survey frequencies. Information on personnel dosimetry and instructions to pregnant workers are also included.

Section IV outlines our proposed Policies and Procedures. This section includes authorization procedures, purchasing, receiving, storage, use, inventory, transportation off campus, disposal, and animal use.

Section V details our proposed emergency procedures. A copy of the emergency phone numbers to be posted in each radioisotope laboratory is shown on the last page.

ITEM #11 - **Waste Management**

All radioactive waste generated at NEOUCOM will be managed according to the following 4 methods.

1) Shipment to Richland, Washington site by an NRC approved Commercial Disposal Service.

We are currently contracting with ADCO Service Inc. (P.O. Box 35; Tinley Park, Illinois 60477) for disposal of the following wastes.

a) Dry solid waste (paper, glass, plastic, metal, etc.)

b) Organic liquid waste

c) Aqueous liquid waste

d) Animal carcasses

e) Scintillation Vials

Attached you will find a copy of their current specific packaging regulations.

2) Incineration

To date we have only incinerated animal carcassas containing ^{3}H or ^{14}C with activities less than 0.05 uCi/gm. We desire to continue this practice.

3) Release To Sanitary Sewer

We request permission to continue releasing small quantities of aqueous dispersible liquids within the guidelines of 10 CFR 20.303. All investigators must supply documentation to the RSO regarding the solubility and dispersibility of all items they intend to release. Releases in the past have been less than 2% of allowable quantities, and it is expected that this trend will continue in future years. Investigators are only allowed to release those isotopes approved by the Radiation Safety Officer and report their releases on the monthly inventory forms. In keeping with the ALARA goal, high activity solutions of short halflife materials (ex. 32-P, 125-I) are safely decayed before being released.

4) Decay On Site

We request permission to decay short halflife byproduct materials on site. These activities will be conducted in room E-46. All decayed materials will be thoroughly surveyed by the RSO before being disposed through conventional methods.

ADCO SERVICES, INC.

P.O. BOX 35 • TINLEY PARK, ILLINOIS 60477 • 312/429-1660

RADIOACTIVE WASTE PACKAGING INSTRUCTIONS

WASTE TYPES:

A. Solid Waste - Compacted
B. Solid Waste - Uncompacted
C. Scintillation Vials - Radioactive
D. Scintillation Vials - Deregulated
E. Other Radioactive Vials
F. Absorbed Liquids - Organic
G. Absorbed Liquids - Aqueous
H. Bulk Scintillation Liquids
I. Animal Carcasses

A. SOLID WASTE - COMPACTED

Solid, compacted waste is to be packaged only in steel drums. Only DRY solid waste is to be compacted.

1. Open and carefully inspect steel drum for cracks, holes or weak spots. If any are detected, set the drum aside, notify our office and our technician will exchange it on his next visit to your facility.

2. Compact dry, solid waste until full. IMPORTANT: Never compact to the point where drum deforms and warps, as this weakens the drum and greatly increases the chances of a seam separating or a crack occurring.

3. Close drum and call ADCO for pick-up of waste.

B. SOLID WASTE - UNCOMPACTED

Solid, uncompacted waste may be packaged in a variety of containers, such as steel or fiber drums, cardboard boxes or wooden crates, provided the waste is 1) compactible and 2) uniformly distributed throughout the container. This type of waste must also be free of liquids and must not contain any animal carcasses. It must also be free of loose syringe needles or needles of any other type. These must be snipped or removed and placed in a puncture-resistant needle receptacle such as a tin can, glass bottle or sturdy plastic jug and labelled "Needles."

Blood and urine samples are not to be packed in dry, solid waste drums. These are liquids and as such are to be packed in liquid waste drums.

To pack this waste:

1. Open and carefully inspect empty container for holes, cracks, or weak spots. If any are detected, set the container aside, notify our office and our technician will exchange it on his next visit to your facility.

2. Place one 4 mil. plastic bag inside of empty container. Drape top portion of bag over top edge of container to prevent contaminating the outside.

3. Add waste until container is full. Seal bag.

4. Close container, seal and call ADCO for pick-up.

C. <u>SCINTILLATION VIALS - RADIOACTIVE</u>

Scintillation vials are only vials having a capacity of 20 ml. or less that have been used in scintillation work. Only the following isotopes may be disposed of as radioactive scintillation vial isotopes:

I 125
Cr51
Fe59
S 35
P 32
Ca45
Na22
H 3
C 14
Co57
Rb86
Ga67
Zn65
In111
Cl36
Hg203

Bactec vials are <u>not</u> scintillation vials and are not to be packed with scintillation vials. They are classed as "Other Radioactive Vials" and are to be packaged according to the instructions found under that heading.

Scintillation vial drums are to contain ONLY scintillation vials containing small amounts of scintillation fluids and vermiculite. Boxes, trays, separators or other types of waste are not allowed in scintillation vial drums.

To pack this type of waste:

1. Open and carefully inspect a steel drum for cracks, holes or weak spots. If any are detected, set the container aside, notify our

office and our technician will exchange it on his next visit to your facility.

2. Place one 4 mil. plastic bag in drum. Drape top portion of bag over top edge of drum to prevent contamination of drum.

3. Place about 4" of vermiculite in bottom of drum. NOTE: Only vermiculite #3 or #4 grade may be used at this time.

4. Add scintillation vials and vermiculite in layers until drum is full.

5. Close plastic liner bag and seal with tape or wire.

6. Close drum and call ADCO for pick-up of waste.

D. SCINTILLATION VIALS - DEREGULATED

Deregulated scintillation vials must meet the following criteria to be classed as such:

1. They must have been used only for scintillation work.

2. They must contain only 14C and/or 3H at a rate of .05 microcuries per gram or less.

The scintillation fluid may be a commercially prepared solution or a scintillation "cocktail" prepared at your facility. Once again, Bactec and similar vials are not scintillation vials and must not be packaged as such.

To pack this type of waste:

1. Open and carefully inspect a steel drum for cracks, holes or weak spots. If any are detected, set the container aside, notify our office and our technician will exchange it on his next visit to your facility.

2. Place one 4 mil. plastic bag in drum. Drape top portion of bag over top edge of drum to prevent contamination of drum.

3. Place about 4" of vermiculite in bottom of drum. NOTE: Only vermiculite #3 or #4 grade may be used at this time.

4. Add scintillation vials and vermiculite in layers until drum is full.

5. Close plastic liner bag and seal with tape or wire.

6. Close drum and call ADCO for pick-up of waste.

DO NOT MIX DEREGULATED WITH RADIOACTIVE SCINTILLATION VIALS!!!

E. OTHER RADIOACTIVE VIALS

All vials not used in scintillation vial work are classed as "Other Radioactive Vials." These may not exceed 50 milliliters capacity and may contain either aqueous and/or organic liquids.

To pack this type of waste:

1. Open and carefully inspect a steel drum for cracks, holes or weak spots. If any are detected, set the container aside, notify our office and our technician will exchange it on his next visit to your facility.
2. Place one 4 mil. plastic bag in drum. Drape top portion of bag over top edge of drum to prevent contamination of drum.
3. Place about 4" of vermiculite in bottom of drum. NOTE: Only vermiculite #3 or #4 grade may be used at this time.
4. Add vials and vermiculite in layers until drum is full.
5. Close plastic liner bag and seal with tape or wire.
6. Close drum and call ADCO for pick-up of waste.

DO NOT MIX WITH DEREGULATED SCINTILLATION VIALS!!!

F & G. ABSORBED LIQUIDS - ORGANIC & AQUEOUS

Any organic or aqueous liquid in a container larger than 50 milliliters must be packaged in a drum set-up for disposal of liquids not contained in vials. Although sctinllation fluids may now be accepted in "bulk" form, other liquids, (blood, urine, sewage and other wastewaters, etc.) must be packaged as either an absorbed or solidified liquid. Solidification of liquids is a specialized operation and as it is requested by very few clients, will not be covered in this instruction manual. If you wish for information on this procedure, please contact our office.

To pack absorbed organic/aqueous liquids:

1. Open and carefully inspect a steel drum for cracks, holes or weak spots. If any are detected, set the drum aside, notify our office and our technician will exchange it on his next visit to your facility.
2. Place approximately 2" of vermiculite absorbent (#3 or #4 grade) inside drum before inserting plastic liner bag.

3. Insert one 4 mil. plastic liner bag and drape top over top edge of drum to prevent contamination of exterior of drum.

4. Begin adding liquid in ratio of approximately one part liquid to four parts vermiculite (EXAMPLE: If 1 liter of liquid is added, approximately 4 liters [or 1 gallon] of vermiculite should be added to drum FIRST). Liquid may then be added to drum. NOTE: It is not necessary to empty liquids if your container is 1 gallon or smaller provided that vermiculite is added first in the prescribed ratio.

IMPORTANT!!!

A. Do not mix liquids that may react with each other and result in a dangerous compound.

B. A maximum of 15 gallons of liquid may be disposed of in a 55 gallon drum.

C. Always add vermiculite first, then install liquids.

5. Continue adding vermiculite and liquids until drum is full. (A maximum of 15 gallons of liquid per 55 gallon drum).

6. Close bag and seal with tape or wire.

7. Label bag "RADIOACTIVE."

8. Close drum and call ADCO for pick-up of waste.

H. BULK SCINTILLATION LIQUIDS

Scintillation fluids, either the commercially prepared solutions or the scintillation "cocktail" liquids mixed at your facility may now be disposed of as a "bulk" liquid after being poured into our double-walled bulk liquid containers. This consists of a 20 gallon tighthead steel drum inside of a 55 gallon openhead steel drum. As this method of disposal is more economical than disposing of scintillation fluids as absorbed liquids, we strongly urge you to pack them in this manner.

To pack bulk scintillation fluids:

1. Open double-walled drum (Outer drum).
2. Remove 2" bung from inner drum and set bung aside.
3. Inspect drum for cracks, holes or weak spots. If any are detected, set the drum aside, notify our office and our technician will exchange it on his next visit to your facility.

4. Add liquids ONLY. Do not discard vials, bottles, syringes, etc. in bulk scintillation fluid drums. ONLY liquids are to

be put in these drums. Also, do not add vermiculite to inner drum.

5. Continue adding liquid until drum is full.

6. Reinstall bung cap to inner drum.

7. Label inner drum "RADIOACTIVE."

8. Close outer drum and call ADCO for pick-up of waste.

I. ANIMAL CARCASSES

Any animal body or portion thereof is classed as an animal carcass and as such must be packaged in a special double-walled container. This is generally a 30 gallon drum inside of a 55 gallon drum, but a larger container is also available for very large animals.

To pack animal carcasses:

1. Open and inspect a double-walled animal drum for cracks, holes or weak spots. If any are detected, set the drum aside, notify our office and our technician will exchange it on his next visit to your facility.

2. Remove plastic bag and lime from inner container and set aside.

3. Install plastic liner bag in inner container and begin adding the animal carcasses, layering in alternative layers of vermiculite and lime.

4. Fill drum to within 4"-6" of top.

5. Close bag and seal with tape or wire.

6. Label inner drum "RADIOACTIVE."

7. Attach lid to drum using ring and bolt.

8. Close outer drum and call ADCO for pick-up of waste.

IMPORTANT POINTS TO REMEMBER WHEN PACKAGING RADIOACTIVE AND DEREGULATED WASTE

1. Keep waste types separate. Don't pack radioactive vials with deregulated (C14 and 3H) vial material. Keep solid, dry waste separate.

2. Pack "BACTEC" vials in a separate drum altogether.

3. NEVER pack animal carcasses with any other type of waste.

4. NEVER throw loose syringe needles or needles of any type into waste drums. ALL needles, whether still attached to syringes or not, must be placed in a separate puncture-resistant container before being put in waste drum.

5. NO biohazardous materials may be disposed of with radioactive material. All viable microorganisms must be autoclaved or chemically rendered harmless before disposal.

6. Under no circumstances are substances (especially liquids) that can react with each other to be placed in the same waste drum.

If you have any question whatsoever regarding waste packaging, please do not hesitate to contact our office.

Thank you.