

FORM NRC 313 I (1-79) 10 CFR 30		U.S. NUCLEAR REGULATORY COMMISSION		1. APPLICATION FOR: <i>(Check and/or complete as appropriate)</i>	
APPLICATION FOR BYPRODUCT MATERIAL LICENSE INDUSTRIAL				a. NEW LICENSE	
<i>See attached instructions for details.</i> Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, N.W., Washington, D. C. or 7015 Eastern Avenue, Silver Spring, Maryland.				b. AMENDMENT TO LICENSE NUMBER	
				c. RENEWAL OF LICENSE NUMBER X 20-07896-01	
2. APPLICANT'S NAME <i>(Institution, firm, person, etc.)</i> Moleculon Research Corporation TELEPHONE NUMBER AREA CODE - NUMBER EXTENSION (617) 547-2353			3. NAME OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION Arthur S. Obermayer TELEPHONE NUMBER AREA CODE - NUMBER EXTENSION (617) 547-2353		
4. APPLICANT'S MAILING ADDRESS <i>(Include Zip Code)</i> 139 Main Street Cambridge, MA 02142			5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED <i>(Include Zip Code)</i> 139 Main Street Cambridge, MA 02142		
(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)					
6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL <i>(See Items 16 and 17 for required training and experience of each individual named below)</i>					
FULL NAME			TITLE		
a.	Arthur S. Obermayer, Ph.D.			President	
b.	S. James Davidson, Ph.D.			Project Manager	
c.	Larry D. Nichols, Ph.D.			Chief Scientist	
7. RADIATION PROTECTION OFFICER Arthur S. Obermayer			Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.		
8. LICENSED MATERIAL					
LINE NO.	ELEMENT AND MASS NUMBER A	CHEMICAL AND/OR PHYSICAL FORM B	NAME OF MANUFACTURER AND MODEL NUMBER <i>(If Sealed Source)</i> C	MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTI- VITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME D	
(1)	Carbon 14	tracer-labeled organic molecules		200 millicuries	
(2)	Iodine 125	tracer-labeled organic molecules		100 microcuries	
(3)	Hydrogen 3	tracer-labeled organic molecules		100 microcuries	
	4) Strontium 90	sealed source	Isotope Products Labs	642-1	563 dps
	5) Bismuth 210	sealed source	Isotope Products Labs	642-2	783 dps
	6) Cesium 137	source sealed in lead	Unknown: source obtained 17 years ago		2.2 mc
To be used in the laboratory for tracer studies of membrane permeability, retention, and flux, gauging, and sample analysis. Sealed sources to be retained for possible use as secondary standards.					

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9. STORAGE OF SEALED SOURCES

LINE NO.	CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED. A	NAME OF MANUFACTURER B	MODEL NUMBER C
	All sealed sources to be retained		
	in locked storage		

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	TYPE OF INSTRUMENT A	MANUFACTURER'S NAME B	MODEL NUMBER C	NUMBER AVAILABLE D	RADIATION DETECTED (alpha, beta, gamma, neutron) E	SENSITIVITY RANGE (milliroentgens/hour or counts/minute) F
(1)	Survey Detector	Precision Radiation Inst.	121 GM	1	alpha, beta gamma, x	0.005 - 20 mr/hr
(2)						
(3)						
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

<input checked="" type="checkbox"/> a. CALIBRATED BY SERVICE COMPANY NAME, ADDRESS, AND FREQUENCY Nuclear Instrument Co. 65 Grove St. Rockland, MA 02370	Survey detector to be calibrated every 90 days during periods when radioisotopes are in use.	<input type="checkbox"/> b. CALIBRATED BY APPLICANT Attach a separate sheet describing method, frequency and standards used for calibrating instruments.
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12. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate.) A	SUPPLIER (Service Company) B	EXCHANGE FREQUENCY C
<input checked="" type="checkbox"/> (1) FILM BADGE <input type="checkbox"/> (2) THERMOLUMINESCENCE DOSIMETER (TLD) <input type="checkbox"/> (3) OTHER (Specify): _____	R. S. Landauer, Jr. & Company Science Road Glenwood Science Park Glenwood, IL 60425	<input type="checkbox"/> MONTHLY <input type="checkbox"/> QUARTERLY <input checked="" type="checkbox"/> OTHER (Specify): Monthly when projects with by-products are underway

13. FACILITIES AND EQUIPMENT (Check where appropriate and attach annotated sketch(es) and description(s).)

- ☒ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS (Include filtration, if any), ETC. See attached sketch
☒ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING (fixed and/or temporary), ETC. Lead shielding for sealed sources.
☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.
☒ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC. Lab coats, aprons and gloves

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED
 Interex Corp., 3 Strathmore Road, Natick, MA 01760

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE

FRONT

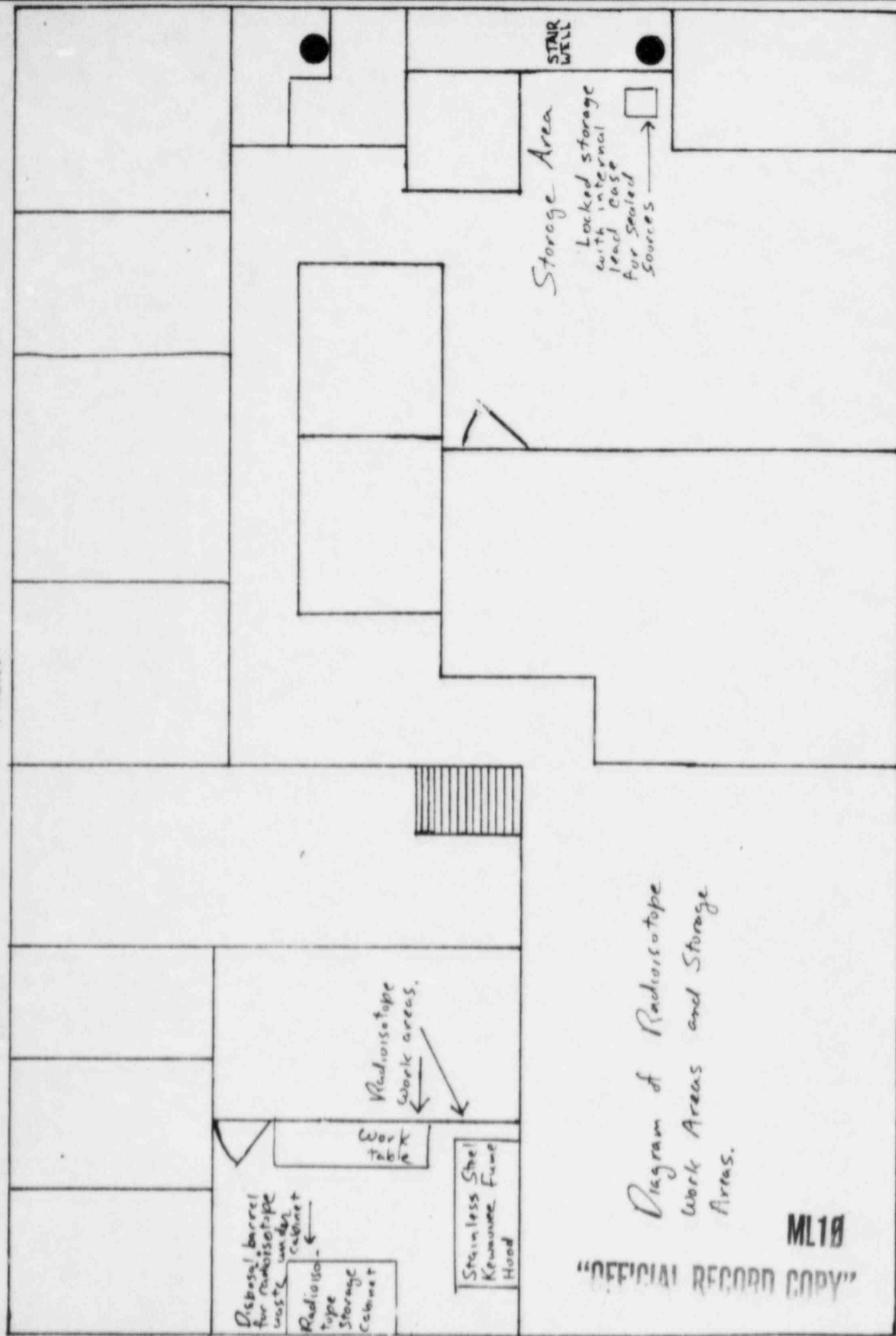


Diagram of Radioscope
Work Areas and Storage
Areas.

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3d Floor

SCALE 1/8

APPENDIX (continued)

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

15. **RADIATION PROTECTION PROGRAM.** Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures *(if needed)*, day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

16. **FORMAL TRAINING IN RADIATION SAFETY.** Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.
 - a. Principles and practices of radiation protection.
 - 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.

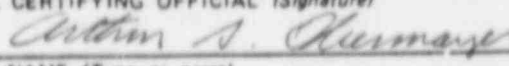
17. **EXPERIENCE.** Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 30, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our 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.

a. LICENSE FEE REQUIRED <i>(See Section 170.31, 10 CFR 170)</i> \$150 Fee paid in May	b. CERTIFYING OFFICIAL (Signature)  c. NAME (Type or print) Arthur S. Obermayer, Ph.D.
(1) LICENSE FEE CATEGORY:	d. TITLE President
(2) LICENSE FEE ENCLOSED: \$	e. DATE November 30, 1983

15. Radiation Protection Program

A) Survey Program and General Procedures

- 1) Working area and personnel will be monitored after each use.
- 2) All radiation work will be reviewed by the Radiation Protection Officer.
- 3) Incoming and outgoing radioactive samples will be checked for contamination and radiation levels by Radiation Protection Officer.
- 4) All radioisotope work and transfer involving possible airborne contamination will be carried out in fume hood. Since radioisotopes will be in the form of tracer-labeled organic compounds of moderate to negligible volatility, no hazards will be created.
- 5) Isotopes will be stored in a closed container.
- 6) Record of each use of isotopes will be maintained on a sign-out sheet.
- 7) All contaminated material will be placed in metal barrels for disposal by Interex Corporation.
- 8) Access to the area where radiosotopes are being used will be limited to those required to use the area.

B) Records Management Program

Moleculon will maintain a Radiation Record Book including dated survey records, isotope acquisition and disposal records, personal monitoring reports, and instrument calibration certification. These records will be reviewed by the Radiation Safety Officer at least monthly when radiation is in use. Each review will be certified by a dated signature in the Radiation Records Book.

C) Instructions To Personnel

Not submitted, because only the persons named in this application will be involved in radioisotope work.

16 & 17. Training and Experience With Radiation

Arthur S. Obermayer
Ph.D., Massachusetts Institute of Technology

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Experience Was Gained</u>	<u>Duration of Experience</u>	<u>Type of Use</u>
C-14	10 mc	Tracerlab	2 1/2 years	Tracer
H-3	5 c	Tracerlab, Mass. Inst. of Technology	6 1/2 years	Tracer
Fission Products	10 mc	Tracer	2 1/2 years	Analysis
C-60	1 mc	Allied Research Associates	2 years	Standardization
Trans-Uranium Elements	10 mc	Tracerlab	2 1/2 years	Analysis

Each of the above placements included formal coursework as well as on-the-job training.

S. James Davidson
Ph.D., Biochemistry, University of Chicago, 1964

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Experience Was Gained</u>	<u>Duration of Experience</u>	<u>Type of Use</u>
I-125	2.0 mc	Tufts University Medical School	8 years	Tracer
		Boston City Hospital, Dept. of Clinical Biochemistry	5 1/2 years	Clinical Radio-immunoassay
H-3	0.5 mc	Boston City Hospital,	2 years	Tracer
		Bio-Research Institute (Cambridge, MA)	1 year	Tracer
		University of Chicago	3 years	Tracer
C-14	0.5 mc	Boston City Hospital	2 years	Tracer
		University of Chicago	3 years	Tracer

Bio-Research Institute

3 years

Tracer

Dr. Davidson received formal training in radioisotope use as part of the doctoral program in biochemistry at the University of Chicago.

Larry D. Nichols

Ph.D., Physical Inorganic Chemistry, Harvard University

<u>Isotope</u>	<u>Maximum Amount</u>	<u>Where Experience Was Gained</u>	<u>Type of Experience</u>
Na-22			
Mn-54			
Mn-56			
Co-57			
Fe-59			
Zn-65	At least	Moleculon Research Corporation	1. Radiation monitoring from underground nuclear tests (Under contract to Dept. of Defense and AEC)
Sr-85	milli-		2. Served on re-entry team collecting post-test underground samples at NTS
Zr-95	curie		
Cd-105	amounts	Many years during more than 20 years with this firm	3. Commercial applications of electron beams to polymer curing and crosslinking.
Ru-106			
Sn-113			
Cs-137			

Cs-137	3 mc	Moleculon Research Corporation	Commercial investigation of methods for measuring level-of-fill in brass cartridges.