

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				<input checked="" type="checkbox"/>	a. NEW LICENSE
See attached instructions for details. 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, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.				<input type="checkbox"/>	b. AMENDMENT TO LICENSE NUMBER
				<input type="checkbox"/>	c. RENEWAL OF LICENSE NUMBER
2. APPLICANT'S NAME <i>(Institution, firm, person, etc.)</i> Unogen, Inc. TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION 804- 295-5912			3. NAME OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION Brian Copcutt, Ph.D. TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION 804-924-8997		
4. APPLICANT'S MAILING ADDRESS <i>(Include Zip Code)</i> Unogen, Inc. 1500 Avon Street Extended Charlottesville, Virginia 22901			5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED <i>(Include Zip Code)</i> Unogen, Inc. 1500 Avon Street Extended Charlottesville, Virginia 22901		
(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. Debra L. Bryant, Ph.D.			Staff Scientist		
b. Michael P. Woodward, Ph.D.			Staff Scientist		
c.					
7. RADIATION PROTECTION OFFICER Brian Copcutt, Ph.D.			Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.		
B. 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 ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME D	
(1)	See Addendum to item 8. for items 8A, 8B, 8C and 8D				
(2)					
(3)					
(4)					
DESCRIBE USE OF LICENSED MATERIAL E					
(1)	See Addendum to item 8E.				
(2)					
(3)					
(4)					

FORM NRC 313 I (1-79)

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 REG2 LIC30
 45-23087-01 PDR

May 5 - II	
Applicant	528
Check No.	528
Amount/Fee Category	\$700 - 3m
Type of Fee	Application
Date Check Rec'd.	6/17/83
Received By	Jacques

30621

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.
(1)	Not Applicable	N/A	N/A
(2)			
(3)			
(4)			

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)	SEE Addendum to item 10					
(2)						
(3)						
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

<input type="checkbox"/> a. CALIBRATED BY SERVICE COMPANY NAME, ADDRESS, AND FREQUENCY	<input checked="" type="checkbox"/> b. CALIBRATED BY APPLICANT <i>Attach a separate sheet describing method, frequency, and standards used for calibrating instruments.</i> See Addendum to Item 11 b.
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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	R.S. Landauer, Jr. and Co. (See Addendum to Item 12)	<input checked="" type="checkbox"/> MONTHLY
<input checked="" type="checkbox"/> (2) THERMOLUMINESCENCE DOSIMETER (TLD)		<input checked="" type="checkbox"/> QUARTERLY
<input type="checkbox"/> (3) OTHER (Specify): _____ _____		<input type="checkbox"/> OTHER (Specify): _____ _____

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.
☒ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING (fixed and/or temporary), ETC.
☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.
☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

14. WASTE DISPOSAL

- ☒ a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED
Teledyne Isotopes, Inc.
- ☐ 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

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.

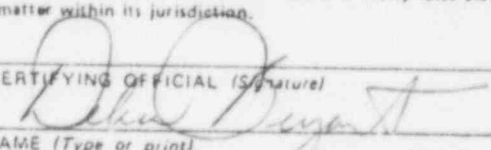
18. CERTIFICATE

(This item must be completed by applicant)

(See Addendum to Item 18)

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> \$ 700.00	b. CERTIFYING OFFICIAL (Signature)  c. NAME (Type or print) Debra L. Bryant, Ph.D.
(1) LICENSE FEE CATEGORY: 3.M	d. TITLE Senior Scientist
(2) LICENSE FEE ENCLOSED: \$ 700.00	e. DATE 5/31/85

ADDENDUM TO ITEM 8

LICENSED MATERIAL

A	B	C	D (mCi)
1. P-32	Orthophosphate	Not applicable	100
2. P-32	Gamma-P32-adenosine triphosphate	Not applicable	10
3. P-32	P32-deoxytriphosphates	Not applicable	50
4. S-35	S35-methionine	Not applicable	100
5. S-35	S35-cysteine	Not applicable	100
6. S-35	Sulphate	Not applicable	100
7. H-3	H3-amino acids	Not applicable	50
8. H-3	H3-hormones	Not applicable	10
9. H-3	H3-vitamins	Not applicable	5
10. C-14	C14-sugars	Not applicable	10
11. C-14	C14-amino acids	Not applicable	50
12. C-14	C14-hormones	Not applicable	10
13. C-14	C14-vitamins	Not applicable	5
14. C-14	N-ethyl maleomide	Not applicable	25
15. C-14	Iodoacetamide	Not applicable	25
16. Cs-137	Check sources	Not applicable	0.01
17. Sr-90	Check sources	Not applicable	0.01

8E. Description of use of Licensed Material

The use of radioactive materials at Unogen, Inc. will be confined to the areas of research and development. Primarily, amino acids with a radioactive tag will be incorporated into cell lines in culture. Also, DNA sequencing techniques will require the incorporation of P-32-labelled deoxytriphosphates.

Probes used for identification of specific DNA/RNA sequences and certain proteins will be labelled with radioactive isotopes and assayed by autoradiography. In general, radioactive materials will be used for basic laboratory research techniques.

No radioactive material use in humans or animals is proposed.

ADDENDUM TO ITEM 10

RADIATION DETECTION INSTRUMENTS

Instrument 1.

- A. Portable beta, gamma geiger counter
- B. Eberline Instrument Corp.
- C. Model E-120 with speaker and HP-190A probe
- D. One available
- E. Beta particle and gamma ray detection
- F. Three linear ranges, 0.5, 5, 50 mR/hr full scale
(600, 6k, 60k cpm)

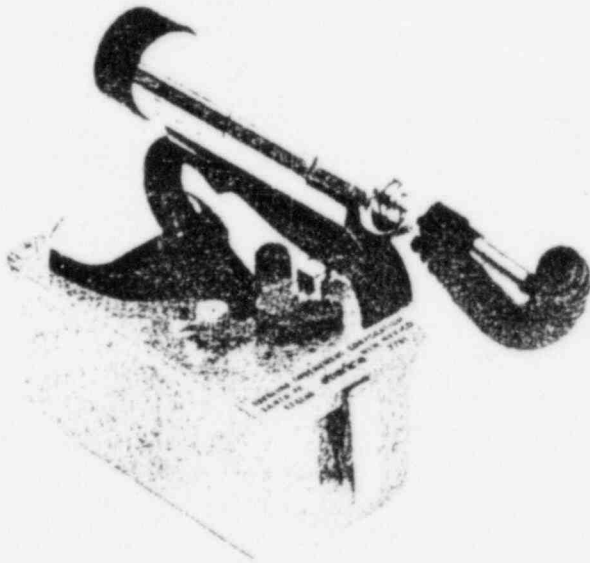
Instrument 2.

- A. Portable beta, gamma geiger counter
- B. Eberline Instrument Corp.
- C. Model E-120 with speaker and HP-260 probe
- E. Beta particle and gamma ray detection
- F. Three linear ranges, 0.5, 5, 50 mR/hr full scale
(600, 6k, 60k cpm)

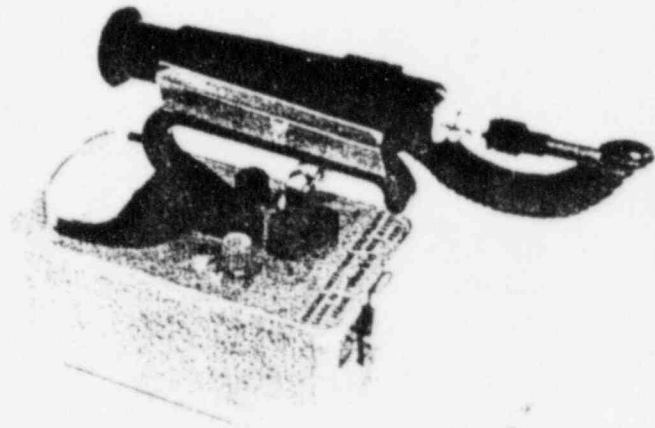
These instruments will be used for monitoring equipment and work areas which involve radioactive material use. They will also be used to monitor incoming radioactive material packages.

The attached manufacturer's product literature provides more detailed instrument specifications, including the detector window thicknesses.

**Portable Beta-Gamma
Geiger Counter
Model E-120**



E-120E – CONTAMINATION MONITOR WITH
HP-190 END WINDOW HAND PROBE
CPM Scale



E-120 – GAMMA DOSE RATE MONITOR WITH
HP-270 ENERGY COMPENSATED HAND PROBE
mR/hr and CPM Scales

UTILIZES INTEGRATED CIRCUITS
SMALL SIZE – LIGHTWEIGHT
LONG BATTERY LIFE WITH TWO D-CELLS
STABLE OVER WIDE TEMPERATURES
EXCELLENT LINEARITY AND STABILITY
VARIABLE METER RESPONSE TIME
BATTERY CONDITION CHECK

eberline

Model E-120

Portable Beta-Gamma Geiger Counter

Model E-120

GENERAL DESCRIPTION

The Model E-120 Portable Geiger Counter is furnished with an energy compensated Hand Probe Model HP-270 which is designed to monitor gamma and x-ray radiation of energies above 40 KeV. A window is provided for the detection of beta radiation. Both mR/hr and counts per minute (cpm) meter scales are provided on the E-120.

The Model E-120E Portable Geiger Counter is furnished with a thin mica end window G-M tube Model HP-190 which is designed to monitor low-energy beta contamination or x-ray radiation. A cpm meter scale is provided on the E-120E.

Both instruments combine the proven reliability of geiger detectors with electronic circuits to provide an instrument with outstanding operational characteristics in a small, lightweight package at an economical price. The large taut band meter provides exceptional readability and linearity with continuously variable response time. Calibration stability results from temperature compensation and battery voltage regulation. High efficiency circuits extend the lifetime of the two D-cell batteries. A rotary switch combines the functions of power switch, battery check and selection of one of three sensitivity ranges. The amplifier driven output may be used with headset, speaker assembly or external pulse counter.

The instrument is furnished complete with probe, CZn batteries and technical manual. Available accessories include headset (BA-201), speaker assembly (SK-1), ^{137}Cs gamma check source (CS-7A), and ^{99}Tc beta check source (CS-13).

SPECIFICATIONS

Ranges: 3 linear ranges, switch controlled: E-120 — 0.5, 5, 50 mR/hr full scale (600, 6k, 60k cpm).
E-120E — 500, 5k and 50k cpm full scale.

Scale Length: 2.37 inches (6 cm).

Linearity: Within $\pm 5\%$ of full scale, $\pm 2\%$ typical.

Response Time: Variable by panel control from 10 seconds to 2 seconds to 90% of final value.

Phone: One pulse for each event counted. Negative pulse approximately 2.5 V amplitude.

Voltage Coefficient: Reading changes less than 10% with battery voltage from 3 to 2 V (new batteries to end point).

Batteries: Two D-cells held by internal captive holders.

Voltage Requirement: 1.6 maximum to 1.0 minimum volts per cell.

Life: Variable depending on cell type, age, temperature, etc. Nominal life with new cells at room temperature is: CZn — 300 hours; alkaline — 500 hours; mercury — 700 hours; NiCd (single charge) — 200 hours.

Detector and Cable:

E-120: Model HP-270 Energy Compensated Beta-Gamma Hand Probe consisting of a halogen filled G-M tube, 30 mg/cm², with beta discriminating shield (see page HP-270). Cable is Model CA-10.

E-120E: Model HP-190, thin window, 1.4 to 2.0 mg/cm² with approximately 9 cm² (1-1/8 inch dia.) area (see page HP-190). Cable is Model CA-10.

Dimensions: Approximately 6-3/4 inches long x 3-3/8 inches wide x 3-1/8 inches high + 3-1/4 inches handle (17.1 x 8.6 x 7.9 + 8.3 cm).

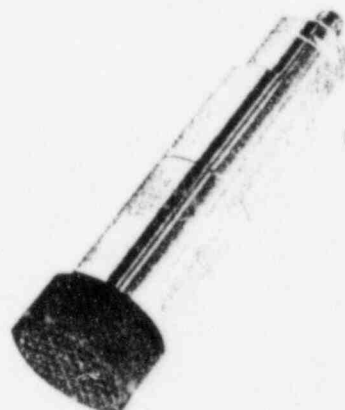
Weight: 3 pounds (1.36 kg) with CZn batteries and hand probe.

Temperature: Typical temperature coefficient of reading is -0.15% per $^{\circ}\text{F}$ from -40° to $+140^{\circ}\text{F}$ (-0.27% per $^{\circ}\text{C}$ from -40° to $+60^{\circ}\text{C}$). Maximum is -0.25% per $^{\circ}\text{F}$ (-0.45% per $^{\circ}\text{C}$).

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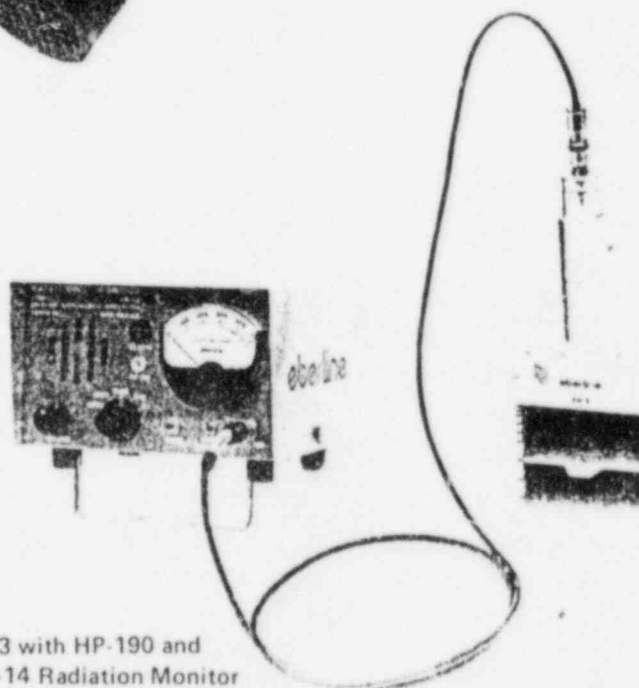
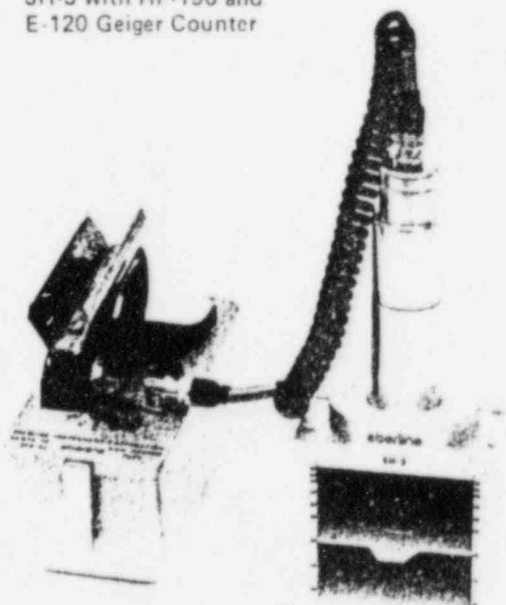
P.O. Box 2108, Santa Fe, New Mexico 87501 (505) 471-3232 TWX: 910-985-0678

Hand Probe Model HP-190A



Hand Probe HP-190

SH-3 with HP-190 and
E-120 Geiger Counter



SH-3 with HP-190 and
RM-14 Radiation Monitor

FIXED GEOMETRY COUNTING
HOLDS HP-190 DETECTOR AND SAMPLE
FOR LABORATORY OR FIELD
PORTABLE — LIGHTWEIGHT AND COMPACT
SPRING CLIPS HOLD SAMPLE SECURELY

eberline

Hand Probe, Model HP-190 A

GENERAL DESCRIPTION

The Model HP-190 provides versatility for any geiger counter. The thin mica window allows monitoring for low energy beta emitting isotopes, and also gives sensitivity to high energy alpha particles. The HP-190 may be ordered with Eberline G-M counters, such as Models E-120, E-140, or E-530, in lieu of the standard probe. However, it does not have the energy compensating shield that some probes, e.g. HP-270, have and is not recommended in applications where the primary purpose is to measure exposure rate (mR/hr.). The 10443-B04 Screen Cap is supplied with the HP-190. This provides protection for the window and retains the low energy detection capability, but at a reduced efficiency.

SPECIFICATIONS

OPERATING VOLTAGE and Life: 900V, life unaffected by operation.

PLATEAU LENGTH and Slope: 200V nominal plateau with 0.1%/V maximum slope.

DEAD TIME AT 900V: 200 μ seconds maximum.

OPERATING TEMPERATURE RANGE: -55°C to +75°C.

MICA WINDOW THICKNESS and Diameter: 1.4 to mg/cm², 2.9 cm dia. (1-1/8 inches).

SIZE: 1-3/8 inches dia. x 5-3/4 inches long (3.5 x 14.6 cm).

WEIGHT: 8 ounces (230g).

CONNECTOR: BNC series coaxial.

GAMMA SENSITIVITY (¹³⁷Cs): Approximately 2500 counts per minute (cpm) per mR/hr.

*BETA EFFICIENCY (1 inch dia. source):

⁹⁰Sr⁹⁰Y (E_{max} 0.54-2.2 MeV): Approximately 45% of 2 π emission rate.

⁹⁹Tc (E_{max} 0.29 MeV): Approximately 30% of 2 π emission rate.

¹⁴C (E_{max} 0.15 MeV): Approximately 10% of 2 π emission rate.

*Measured without screen cap. With cap in place, efficiency will be approximately 1/2 of that listed.

NOTE: The saturation specification of Eberline geiger counters is not applicable when an HP-190 is used in place of the HP-270.

Sample Holder, Model SH-3

GENERAL DESCRIPTION

Designed for quick and easy positioning of small samples at desired distances from the HP-190 detector window. The detector rests on a narrow shoulder and is held firmly in position by friction against an O-ring. The sample holder slide may be placed in nine different positions and has spring clips to hold the sample in position.

SPECIFICATIONS

SAMPLE HOLDER POSITIONS: 1/8, 1/4, 3/8, 19/32, 27/32, 1-3/32, 1-19/32, 2-1/8, 2-5/8 inches sample holder to probe window (0.32, 0.64, 0.95, 1.51, 2.14, 2.78, 4.05, 5.40, 6.67 cm).

DIMENSIONS: 4 inches long x 2-1/2 inches wide x 4 inches high (10.2 x 6.4 x 10.2 cm).

MATERIAL AND FINISH: Clear anodized aluminum with engraved nomenclature.

SAMPLE HOLDER SLIDE: One slide furnished with spring clips to hold sample in position.

WEIGHT: 1-1/2 pounds (0.7 kg).

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P.O. Box 2108, Santa Fe, New Mexico 87501 (505) 471-3232 TWX: 910-985-0678

Hand Probe
Model HP-260



HIGH SENSITIVITY BETA PROBE
LARGE THIN WINDOW PANCAKE G-M DETECTOR
PROTECTIVE SCREEN OVER WINDOW
LONG HANDLE FOR EASE OF MONITORING
OPERATES WITH ANY 900 VOLT INSTRUMENT

eberline

Hand Probe, Model HP-260

GENERAL DESCRIPTION

The Model HP-260 Hand Probe is a lightweight, sensitive Geiger-Mueller detector for monitoring beta radiation from very low energies and up. This hand probe offers a thin mica window, a large open area protected by a sturdy wire screen which allows useful sensitivities for beta energies down to about 40 KeV. It is ideal for contamination control when used as a personnel frisker, or for monitoring of tables, floors, equipment, etc.

The Model HP-260 Hand Probe may be used on any 900 volt portable instrument or laboratory monitor.

SPECIFICATIONS

OPERATING VOLTAGE: 900 \pm 50 volts.

PLATEAU LENGTH: 100 volts minimum.

PLATEAU SLOPE: 0.1%/volt maximum.

DEAD TIME: 50 usec maximum.

TEMPERATURE RANGE: -35°C to +75°C (-67°F to +167°F).

LIFE: Unaffected by operation.

MICA WINDOW THICKNESS: 1.4 to \pm .0 mg/cm².

MICA WINDOW AREA: 15 cm² (1 3/4" diameter).

SERIES RESISTOR (in probe): 3.3 megohms.

GAMMA SENSITIVITY (¹³⁷Cs into window): Approximately 3600 CPM/mR/hr.

*BETA EFFICIENCY (1" diameter source, 2 π):

⁹⁰Sr-⁹⁰Y (E max. .54-2.2 MeV) - Approximately 45%

⁹⁹Tc (E max. .29 MeV) - Approximately 30%

¹⁴C (E max. .15 MeV) - Approximately 10%

CONNECTOR: BNC series coaxial.

SIZE: 10" L x 2-3/4" W x 2-1/2" H (25.4 x 7 x 6.4 cm).

WEIGHT: 1-1/4 lbs. (0.57 Kg).

*All efficiencies with screen in place. Removal of screen will increase given efficiencies by approximately 40%.

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P.O. Box 2108, Santa Fe, New Mexico 87501 (505) 471-3232 TWX: 910-985-0678

ADDENDUM TO ITEM 11 b.

CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

NOT
LC
APP
All instruments listed in item 10 will be calibrated on a semi-annual schedule. Calibration will be performed by the licensee using a TECH/OPS Model 726 Cesium-137 source (serial number 122, 0.1040 curies activity as of 5/7/76). Source output is certified to be accurate within $\pm 3\%$ of a reference NBS Cobalt-60 standard (see attached certification). Re-calibration will also be performed following instrument repair or maintenance. Below is presented a detailed description of the calibration procedure.

Each scale of the instrument shall be calibrated at least at two points such that (a) one point is in each half of the scale and (b) the two points are separated by 35-50% of full scale.

The Radioactive Decay Law shall be used to calculate source output at the time of calibration based on initial output data provided by the source manufacturer.

The proper source - instrument distance for calibration shall be determined using the Inverse Square Law for a point source.

The exposure rate measured by the instrument shall differ from the true exposure rate by less than 10% of full scale. Readings within $\pm 20\%$ will be considered acceptable if a calibration chart or graph is prepared and attached to the instrument.

Calibration shall be performed by or under the supervision of the licensee Radiation Protection Officer as listed in item 7 of this application.

Records of instrument calibrations will be maintained at Unogen, Inc.

Instrument calibrations shall be supplemented by readings of a reference check source taken before each use and after each survey to insure that the instrument was operational during the survey. Check source readings will also be taken after each battery change. The reference check source shall be of long half-life and shall be read at the time of the above described calibration. The readings shall be taken with the check source placed in a specific geometry relative to the detector. If any reading with the same geometry is not within $\pm 20\%$ of the reading measured immediately after calibration the instrument should be recalibrated.

Standards Laboratory Report



Technical Operations, Incorporated

Radiation Products Division
Burlington, Massachusetts 01803

EXTERNAL CONTAMINATION OR LEAKAGE

DATE 9-9-76 MICROCURIES 605 BY P.R.

DATE 9-9-76 MICROCURIES 605 BY P.R.

GAMMA RAY SOURCE CALIBRATION

Isotope

Test No.

Date Measured

Cs¹³⁷

95802

5-7-76

Source
Identification

Roentgens/Hr.
at 1 Meter

Curies

S-197

.03328

.1040

Source decay correction factors

Age in:	Cobalt-60		Iridium-192		Cesium-137
	years	mos	weeks	days	years
0	1.000	1.000	1.000	1.000	1.000
1	.877	.989	.937	.991	.977
2	.768	.978	.877	.981	.955
3	.674	.967	.821	.972	.933
4	.590	.957	.769	.963	.912
5	.518	.946	.721	.954	.892
6	.454	.936	.675	.945	.871
7	.398	.926	.632	.937	.852
8	.349	.916	.592		.830
9	.306	.905	.554		.813
10	.268	.895	.519		.795
11	.235	.886	.486		.777
12	.206	.877	.455		.759
T _{1/2}	5.26y		74.0d		30.2y
Rhm/ci	1.30		0.55		0.32

The gamma-ray emission of the sealed source herein described was intercompared with the radiation from a reference standard cobalt-60 source whose intensity had been established relative to a National Bureau of Standards calibrated cobalt-60 source. Comparison was made either with an uncollimated plastic-lined ionization chamber encased in a 3-mm thick aluminum container sealed against atmospheric pressure, or with an NBS-calibrated Victoreen R-meter whose readings were compensated for atmospheric pressure and temperature. All readings were corrected for air scattering and absorption. The source was measured with its axis of symmetry parallel with/perpendicular to the line joining source and detector. The reported output is believed to be accurate within ± 3 percent, the stated uncertainty of the reference NBS sources. Precision is believed to be better than ± 1 percent.

Signed Paul R. Rondeau

Calibration performed for: UNIVERSITY OF VIRGINIA
Mod. # 726 9/122 REACTOR FACILITY
CHARLOTTESVILLE, VIRGINIA

ADDENDUM TO ITEM 12

PERSONNEL MONITORING DEVICES.

The exchange frequency of personnel monitoring devices will be as follows:

1. Film Badge - Exchanged Quarterly
2. TLD's (Ring Badge) - Exchanged Monthly

*see
form*

The quarterly exchange frequency for film badges was determined based on the low activities and energies of beta emitters which will be used by workers. The Radiation Safety Officer and/or the Radiation Safety Committee may increase the frequency of dosimetry exchange at their discretion.

ADDENDUM TO ITEM 13

FACILITIES AND EQUIPMENT

A.

All uses of radioactive material by Unogen personnel will be limited to the facility at 1500 Avon Street Extended in Albemarle County near Charlottesville in the state of Virginia. The location of the facility is shown on the map on page 13-2. Also located at this site are other light industries. The Unogen facility is separated from the other facilities by a fire wall and has a separate heating, ventilation and air conditioning system. A sketch of the Unogen site including the location of the other facilities is included on page 13-3.

Access to the entire facility is controlled at the administration office. The loading dock entry will remain locked except during facility-controlled deliveries. The entire building except for the administration/reception area and the two adjoining offices will be considered a "restricted area" as defined in 10 CFR part 20. The non-restricted areas within the facility are shown on the floor plan with cross-hatching.

All use of uncontained radioactive material will be restricted to the protein laboratory as shown on the sketches on pages 13-4 and 13-5. Radioactive waste will be packaged and stored in the locked room as indicated. Incubation of microcurie quantities of radiolabelled cells in closed dishes will be performed in the Tissue Culture laboratory.

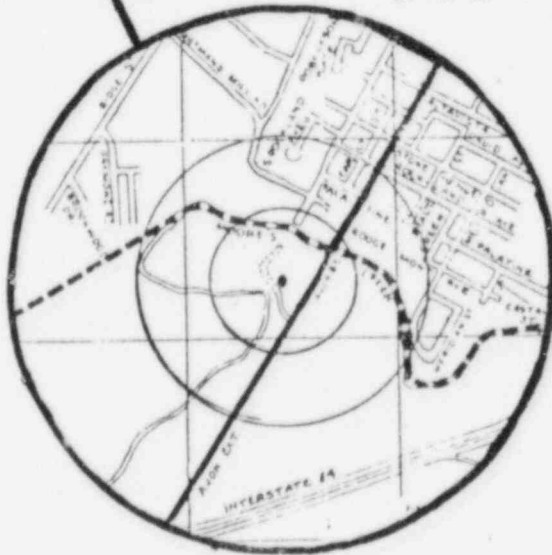
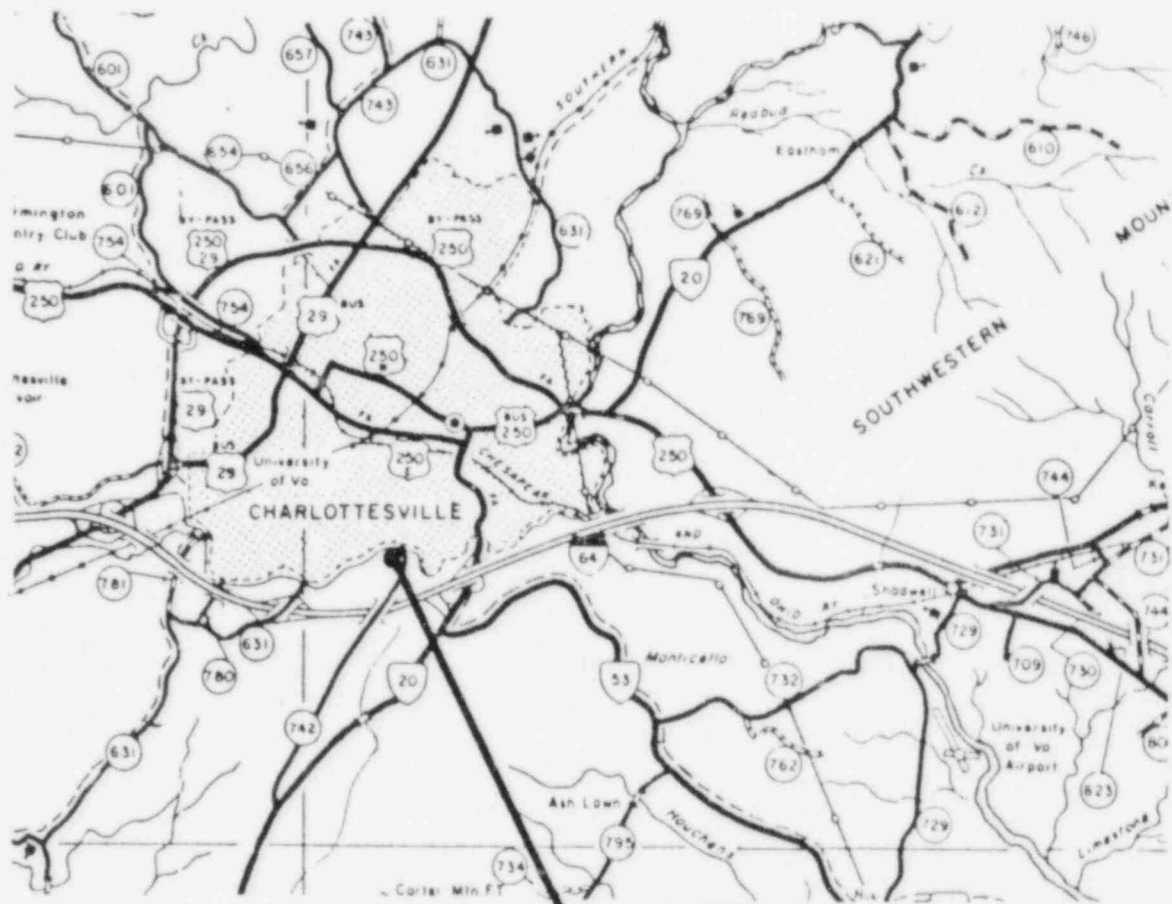
B.

Standard polyethylene-type, covered trash cans and carboys that have been clearly labelled as radioactive will be used to collect radioactive waste prior to transporting it to the radioactive waste storage room.

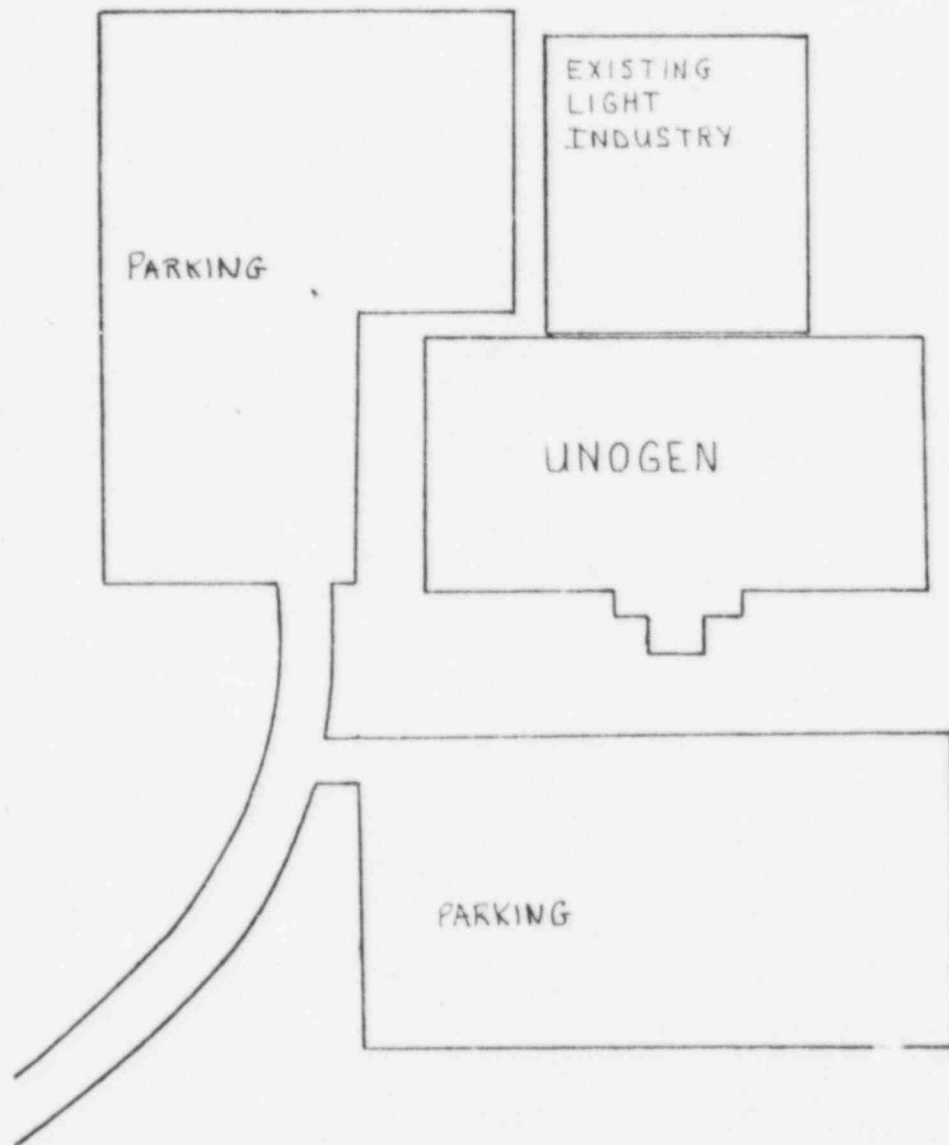
Four plexiglass shields are available for use with P-32. These shields are 12" by 12" sheets connected at right angles.

Fabric laboratory jackets and disposable gloves will also be available.

Tongs and/or forceps will be available for remote handling.



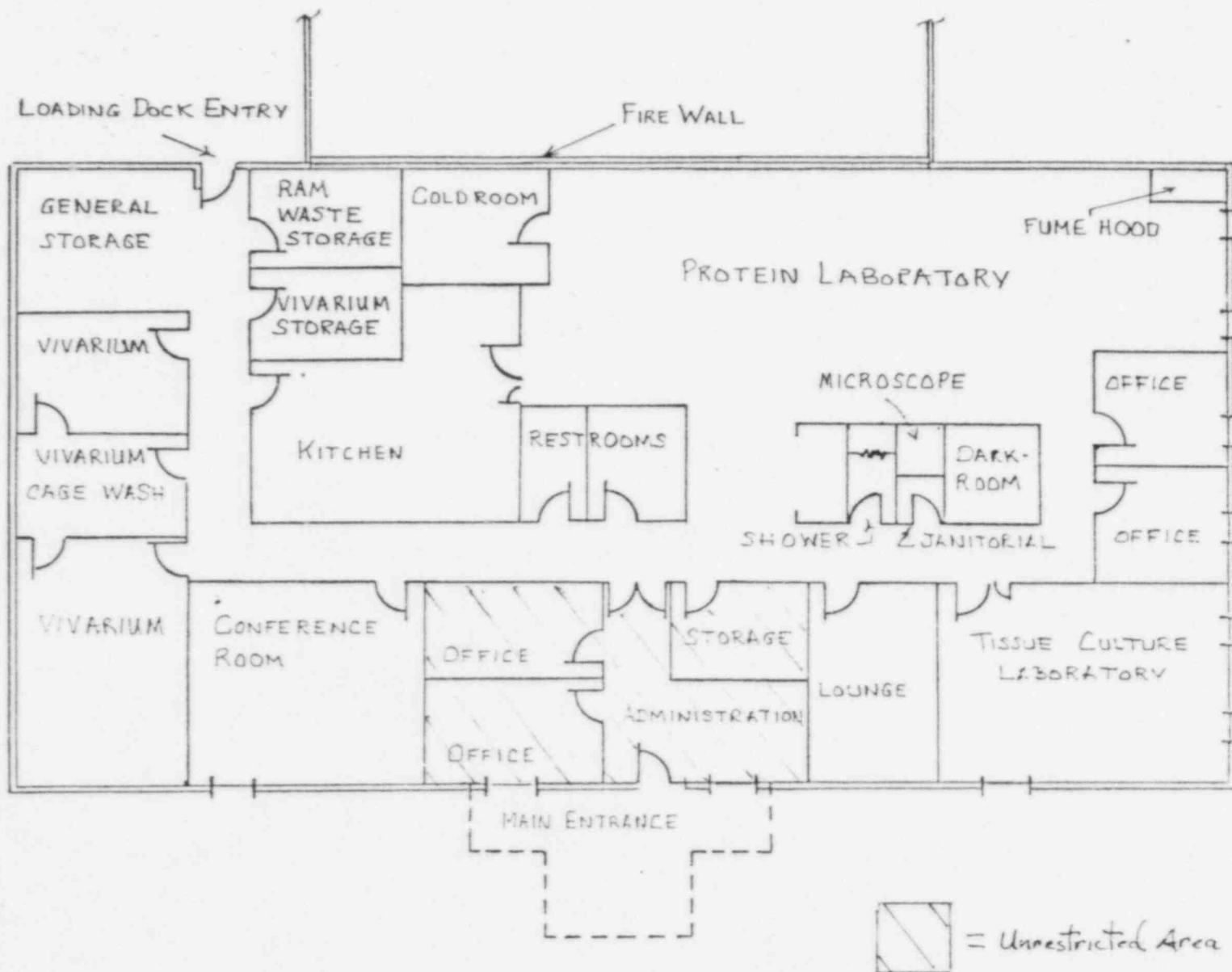
UNOGEN, INC.
 1500 AVON ST. EXTENDED
 ALBEMARLE COUNTY
 VIRGINIA



UNOGEN, INC.
1500 AVON ST. EXTENDED
MAY, 1985



42 101 100 10000 1 100000
42 102 100 10000 1 100000
42 103 100 10000 1 100000



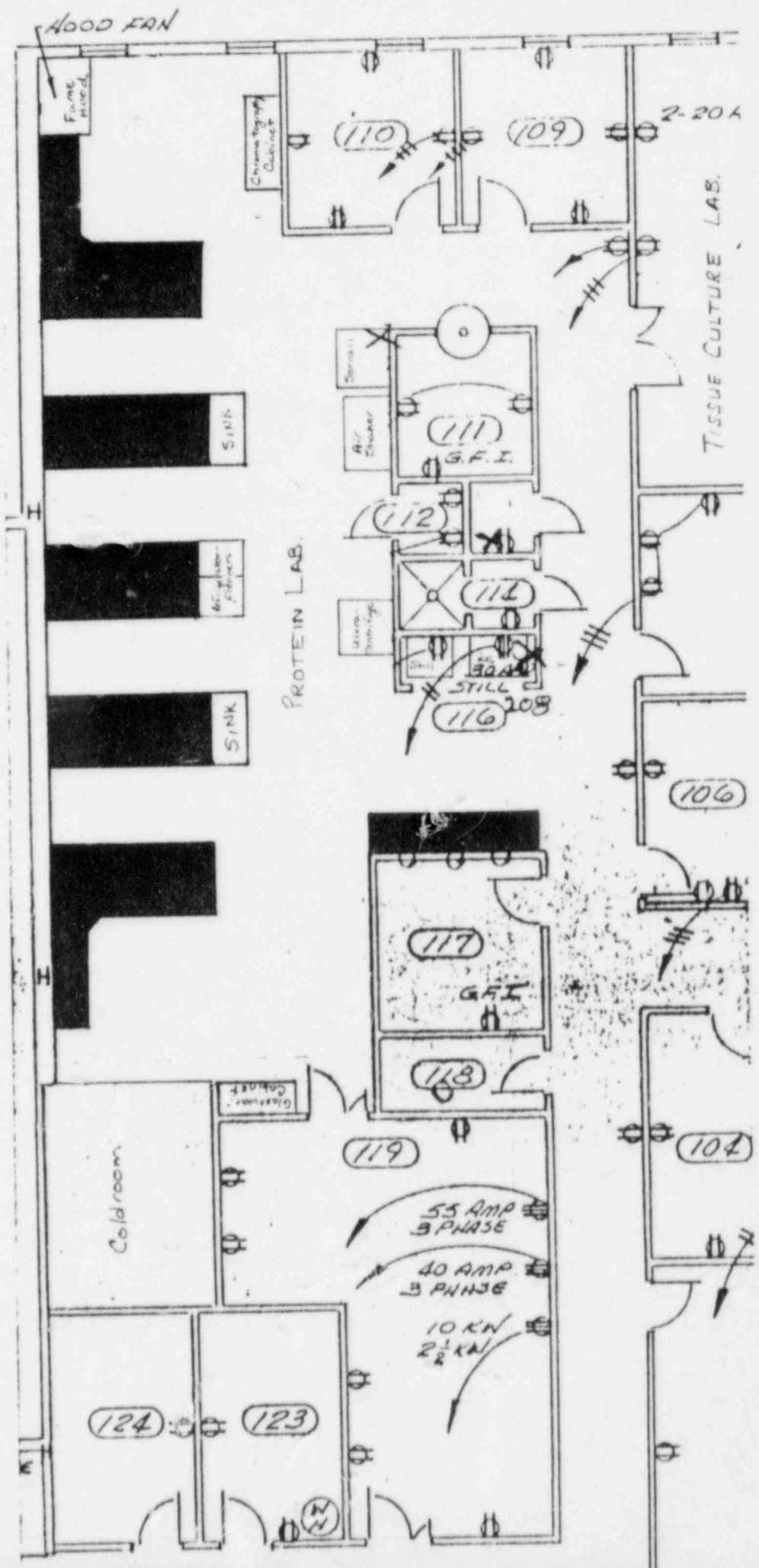
13-4

UNOGEN INC.
1500 AVON ST. EXTENDED
MAY, 1985

1/8" / ft

PROTEIN LABORATORY
DETAIL

UNOGEN, INC
MAY, 1985



RADIATION PROTECTION PROGRAM

INTRODUCTION

The radiation protection program at Unogen, Inc. is directed by the Radiation Safety Committee through the office of the Radiation Safety Officer (referred to on license form NRC-313 I as "Radiation Protection Officer"). This individual shall be a paid consultant who operates entirely outside the lines of authority of Unogen, Inc. That is, he shall have autonomous authority to enforce the provisions of the license and the "Radiation Safety Guide" and will serve at the discretion of the Radiation Safety Committee.

A. SURVEY PROGRAM

Regular systematic surveys shall be performed by Unogen employees and independent consultants in all areas where radioactive materials (RAM) are used and stored. For a complete review of these procedures, reference Section III, "Instructions to Personnel Working with Radioactive Materials", of this institution's Radiation Safety Guide.

These surveys shall consist of radiation level measurements made with a suitably sensitive instrument, and periodic swipe tests measured with an instrument sensitive enough to detect the presence of H-3 and C-14.

All radioactive materials used in Unogen laboratories shall be in such a form as to preclude the possibility of airborne concentrations of radioactive material greater than 10% of the quantity specified in Appendix B of 10 CFR Part 20. No radioactive effluent will be released in any form to the environment.

Prior to routine use of radioactive materials by Unogen employees, the Radiation Safety Officer shall make appropriate trial runs with safety measurements to include:

- a. air grab samples at breathing level in the work area to determine that airborne concentrations of radioactive materials are less than 10% of quantities specified in Appendix B of 10 CFR Part 20.
- b. stack release samples taken at the outside air vent to the fume hood while the hood is being used for routine radioactive material use. Sample volumes and filter paper specifications will be sufficient to allow detection of concentration levels specified in Appendix B of 10 CFR Part 20.

B: Records Management System

It will be the policy of Unogen, Inc. to maintain all radioactive materials records for an indefinite period of time. Records may be disposed of or destroyed only when authorized by the appropriate licensing authority (i.e., The Nuclear Regulatory Commission).

1. Personnel Dosimetry

Records of individual dosimetry will be maintained in compliance with the provisions of 10 CFR sections 20.101 and 20.102. These records will be available to employees as mandated by 10 CFR Section 19.13.

2. RAM Inventory

Records will be maintained on all Radioactive materials purchased by Unogen, Inc. and shall include at least the following:

- a. identification of radionuclide
- b. activity of radionuclide on date of receipt
- c. date of receipt of radionuclide
- d. ultimate disposition of radionuclide
- e. interim use of radionuclide until ultimate disposition

3. Waste Records

Records of all radioactive waste disposed of by Unogen, Inc. shall include at least the following:

- a. identification of radionuclide
- b. activity of radionuclide on date of disposal to inside waste storage
- c. a quarterly inventory of all waste in storage showing radionuclide identification and current activity calculated to reflect decay
- d. radioactive waste disposal manifest of all outgoing waste to include date of shipment, radionuclides shipped and activity of radionuclides on date of shipment (in accordance with 10 CFR Section 20.301 and Part 61.

Inventory and waste records shall be coordinated in such a way as to continuously account for the whereabouts of all radioactive materials received at Unogen, Inc., and to insure that the possession limits specified in the license are never exceeded.

4. Survey Records

All radiation level and area survey records specified in the Radiation Safety Guide shall be permanently maintained in a central location by Unogen management.

5. Radiation Safety Committee

Minutes, reports, and documented actions of the Radiation Safety Committee shall be maintained in a central location by Unogen management.

6. Commission Records

All NRC licenses, amendments and correspondence, and records of NRC inspections, investigations and follow-ups shall be maintained in a central location by Unogen management.

Where feasible, all records will be maintained in both computerized files and permanent hard copy. Responsibility for maintenance of complete records is designated to the Secretary of the Radiation Safety Committee who shall be a paid, full-time employee of Unogen, Inc. Reviews of all permanent file records will be performed by the Radiation Safety Officer at least annually.

C. Sealed Source Leak Test Procedures

No individual sealed sources containing more than 100 microcuries of a beta or gamma emitter, or more than 10 microcuries of an alpha emitter will be held in the possession of the licensee. Therefore no leak test procedures are required at the time of this application.