AC FORM 313			U.S. NUCLEAR REGULATORY COMMISSION
1-841 D CFH 30, 32, 33, 34.	APPLICATION FOR	MATERIAL LICENSE	3150-0120 Expires 5-31-87
s and HU	AFFEIGATION FOR		030-30570
NSTRUCTIONS: SEE THE APPROPRIATE L:C	ENSE APPLICATION GUIDE FOR DE	ETAILED INSTRUCTIONS FOR COM	PLETING APPLICATION SEND TWO COPIES
EDERAL AGENCIES FILE APPLICATIONS WITH		IF YOU ARE LOCATED IN	
U.S. NUCLEAR REGULATORY COMMISSION	CTV AMEC	ILLINOIS, INDIANA, IOWA, MICHIGA	N, MINNESOTA, MISSOURI, OHIO, OR C:
WASHINGTON, DC 20555	LOWS, IF YOU ARE	U.S. NUCLEAR REGULATORY CO MATERIALS LICENSING SECTION 799 ROOSEVELT ROAD	MMISSION, REGION III
DANECTICUT, DELAWARE, DISTRICT OF COLUMB ASSACHUSUTTS, NEW JERGEY, NEW YORK, PENN R VERMONT SEND APPLICATIONS TO:	IA, MAINE, MARYLAND, SYLVANIA, RHODE ISLAND,	GLEN ELLYN, IL 60137 ARKANSAS, COLORADO, IDAHO, KA NEW MEXICO, NORTH DAKOTA, OK	NSAS, LOUISIANA, MONTANA, NEBRASKA, LAHOMA, BOUTH DAKOTA, TEXAS, UTAH,
U.S. NUCLEAR REGULATORY COMMISSION, REC NUCLEAR MATERIAL SECTION B 631 PARK AVENUE	SION I	OR WYOMING, SEND APPLICATIONS U.S. NUCLEAR REGULATORY CO MATERIAL RADIATION PROTECT EVID RANN DI AZA DELVE SUITE	NMISSION, REGION IV TION SECTION 1000
KING OF PRUSSIA, PA 194/6 (LABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSI UERTO RICO, SOUTH CAROLINA, TENNESSEE, VIS VIET UNDERLAS ABBLICATIONS TO:	SSIPPI, NORTH CAROLINA, RGINIA, VIRGIN ISLANDE, DR	ARLINGTON, TX 76011 ALASKA, ARIZONA, CALIFORNIA, H AND U.S. TERRITORIES AND POSSE	IAWAII, NEVADA, OREGON, WASHINGTON, SSIONS IN THE PACIFIC, SEND APPLICATIONS
U.S. NUCLEAR REGULATORY COMMISSION, REG MATERIAL RADIATION PROTECTION SECTION 101 MARIETTA STREET, SUITE 2900 ATLANTA, GA 30323	וו אסופ	TO: U.S. NUCLEAR REGULATORY CO MATERIAL RADIATION PROTEC 1460 MARIA LANE, SUITE 210 WALNUT CREEK, CA 94596	DMMISSIOI: REGION V TION SECTION
FERSONS LOCATED IN AGREEMENT STATES SEND	APFLICATIONS TO THE U.S. NUCLEAR I RY COMMISSION JURISDICTION.	REGULATORY COMMISSION ONLY IF TH	HEY WISH TO POSSESS AND USE LICENSED MATERIA
THIS IS AN APPLICATION FOR (Check appropriate	item)	2. NAME AND MAILING ADDRESS OF	APPLICANT (Include Zip Code)
A. NEW LICENSE		AT Biochem	D 1
B. AMENDMENT TO LICENSE NUMBER	No. 45 years and a second s	Malvern PA 10	Parkway
C. RENEWAL OF LICENSE NUMBER	ally named and a subscription of the	natvern, rA 19.	222
AT Blochem	L BE USED OR POSSESSED.	8904 REG1 37-2	260415 880812 LIC30 28206-01 PDR
Malvern, PA 19355	rkway	88	
A NAME OF PERSON TO BE CONTACTED ABOUT T	HIS APPLICATION		TELEPHONE NUMBER
Robert G.L. Shorr, PhD	or James Rue		(215) 889 -9300
UBMIT ITEMS 5 THROUGH 11 ON 8% × 11" PAPER	THE TYPE AND SCOPE OF INFORMATI	ON TO BE PROVIDED IS DESCRIBED IN	THE LICENSE APPLICATION GUIDE.
<ol> <li>RADIOACTIVE MATERIAL         <ul> <li>Element and mass number, b. chemical and/or pt which will be possessed at any one time. See Si</li> </ul> </li> </ol>	ixical form, and c. maximum amount upplement. A	6. PURPOSEIS) FOR WHIGH LICENS	Ed Material Will be used Tement A
7. INDIVIDUALISI RESPONSIBLE FOR RADIATION TRAINING AND EXPERIENCE. SEE SI	ISAFETY PROGRAM AND THEIR upplement B	8. CALINING FOR INDIVIDUALS W See Supp.	ORKING IN OR FREQUENTING RESTRICTED AREAS
R FACILITIES AND EQUIPMENT. See S	upplement D	10. RADIATION SAFETY PROGRAM	See Supplement E
11. WASTE MANAGEMENT. See S	upplement F	FEE CATEGORY 3M	ENCLOSED \$ 700.00
IS CERTIFICATION. (Must be completed by applicate BINDING UPON THE APPLICANT THE APPLICANT AND ANY OFFICIAL EXECUT PREPARED IN CONFORMITY WITH TITLE 10.0 IS TRUE AND CORRECT TO THE BEST OF THE WARNING IS U.S.C. SECTION 1001 ACT OF JU TO ANY DEPARTMENT OR AGENCY OF THE U SIGNATURE - CERTIFYING OFFICED	NO THE APPLICANT UNDERSTANDS TH ING THIS CERTIFICATION ON BEHALF CODE OF FEDERAL REGULATIONS, PAR IR KNOWLEDGE AND BELIEF JNE 25, 1948, 62 STAT 749 MAKES IT A ( INITED STATES AS TO ANY MATTER WI TYPED/PRINTED NAME ROBETT G.L. Shorr	AT ALL STATEMENTS AND REPRESENT OF THE APPLICANT, NAMED IN ITEM 2, ITS 30, 32, 33, 34, 35, AND 40 AND THAT CRIMINAL OF ENSE TO MAKE A WILLFI THIN ITS JURISDICTION. TITLE Vice THD President	ATIONS MADE IN THIS APPLICATION ARE CERTIFY THAT THIS APPLICATION IS ALL INFORMATION CONTAINED HEREIN. ULLY FALSE STATEMENT OR REPRESENTATION DATE DATE
s. ANNUAL RECEIPTS         b. NI           X         <\$250K	UMBER OF EMPLOYEES (Total Tot trire facility excluding outside contractors)	IN ECONOMIC DATA d WOULD YOU BE WILLING TO FUF ON THE ECONOMIC IMPACT OF C PROPOSED NRC REGULATIONS T 	RNISH COST INFORMATION (Dollar and/or staff hours) URRENT NRC REGULATIONS OR ANY FUTURE THAT MAY AFFECT YOU? (NRC requisitions permit or financial-propriatary-information furnished to
\$500K-750K \$7M-10M C.NI	N/A union	N D YER D A	NO
S / DUK - TW	FOR NR	C USE ONLY	
APP May 97 3	CATEGORY COMMENTS		S. Kember
AMOUNT RECEIVED CHECK NUMBER	"OFFICIAL RECO	RD COPY"ML10	108824 DATE 5/11/82

### PRIVACY ACT STATEMENT

Pursuant to 5 U.S.C. 552a(e)(3), enacted into law by section 3 of the Privacy Act of 1974 (Public Law 93-579), the following statement is furnished to individuals who supply information to the Nuclear Regulatory Commission on NRC Form 313. This information is maintained in a system of records designated as NRC-3 and described at 40 Federal Register 45334 (October 1, 1975).

- 1. AUTHORITY: Sections 81 and 161(b) of the Atomic Energy Act of 1954, as amended (42 U.S.C. 2111 and 2201(b)).
- PRINCIPAL PURPOSE(S): The information is evaluated by the NRC staff pursuant to the criteria set forth in 10 CFR Parts 30, 32, 33, 34, 35 and 40 to determine whether the application meets the requirements of the Atomic Energy Act of 1954, as amended, and the Commission's regulations, for the issuance of a radioactive material license or amendment thereof.
- 3. ROUTINE USES: The information may be (a) provided to State health departments for their information and use; and (b) provided to Federal, State, and local health officials and other persons in the event of incident or exposure, for their information, investigation, and protection of the public health and safety. The information may also be disclosed to appropriate Federal, State, and local agencies in the event that the information indicates a violation or potential violation of law and in the course of an administrative or judicial proceeding. In addition, this information may be transferred to an appropriate Federal, State, or local agency to the extent relevant and necessary for an NRC decision or to an appropriate Federal agency to the extent relevant and necessary for that agency's decision about you.
- 4. WHETHER DISCLOSURE IS MANDATORY OR VOLUNTARY AND EFFECT ON INDIVIDUAL OF NOT PROVID-ING INFORMATION: Disclosure of the requested information is voluntary. If the requested information is not furnished, however, the application for radioactive material license, or amendment thereof, will not be processed. A request that information be held from public inspection must be in accordance with the provisions of 10 CFR 2.790. Withholding from public inspection shall not affect the right, if any, of persons properly and directly concerned need to inspect the document.

5. SYSTEM MANAGER(S) AND ADDRESS: U.S. Nuclear Regulatory Commission Director, Division of Fuel Cycle and Material Safety Office of Nuclear Material Safety and Safeguards Washington, D.C. 20555

### Supplement A

1. Reference Items 5 and 6, NRC Form 313.

2. Radioactive materials :

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Isotope	Physical Form	Activity
Phosphorus-32	liquid	100 millicuries
Sulfur-35	liquid	50 millicuries
Iodine-125	liquid	50 millicuries

3. Materials listed in item 2 above are for biochemical research and development only.

### Supplement B

1. Reference Item 7, NRC Form 313.

2. The names and qualifications of the Radiation Protection Officer and Alternate Radiation Protection Officer are at enclosures 1 and 2 respectively.

### Resume of Robert G.L. Shorr

### EDUCATION:

PhD, Biochemistry, Imperial College of Science and Technology, University of London, 1980

BS, Biology, State University of New York at Buffalo, 1975

### EXPERIENCE:

1988-Present, Vice President for Technology and Co-Founder, AT Biochem

1986-1988, Associate Director, Department of Molecular Pharmacology, Smith Kline & French Laboratories Serve as associate director in major pharmaceutical manufacturer's research center. Supervise and conduct research utilizing a variety of compounds including radioisotopes, especially P-32, S-35 and I-125.

- 1984-1986, Senior Investigator, Department of Molecular Pharmacology, Smith Kline & French Laboratories Research group leader at R&D Center. Research involved the utilization of radioisotopes in pharmacological research.
- 1982-1984, Associate Senior Investigator, Department of Molecular Pharmacology, Smith Kline & French Laboratories

### AWARDS:

NIH University Fellowship, State University of New York

MRC Research Fellowship, University of London

NIH Post-Doctoral Fellowship, Duke University

Howard Hughes Medical Institute Research Associatship, Duke University

### MEMBERSHIPS:

American Chemical Society American Association for the Advancement of Science American Institute of Chemists-elected Fellow Royal Chemist Society New York Academy of Science Resume of Robert J. Molinari

#### EDUCATION:

MBA, Dartmouth College, 1979

PhD, Polymer Chemistry, Brown University, 1977

AB, Dartmouth College, 1974

### EXPERIENCE:

1988-Present, President and CED, AT Biochem

1985-1988, McKinsey & Company, Management Consultant

1979-1985, Raychem Corp., Market Development Director and Research Manager, listed on NRC license as approved operator of Co-60 and electron beam irradiators.

1978, W.R. Grace Washington Research Center, Venture Analyst

#### PATENTS:

Four patents assigned to Raychem Corporation, one unassigned

### Supplement C

### 1. Reference Item 8, NRC Form 313.

2. All new researchers and technicians using or handling radioactive materials will be given a minimum of four hours training in proper handling techniques and radiation safety by the Radiation Protection Officer (RPO). Periodic training of radiation workers by the RPO will be conducted in accordance with Title 10, Code of Federal Regulations, Part 19 (10 CFR 19).

### Supplement D

### 1. Reference Item D, NRC Form 313.

2. At enclosure 1 is a copy of the floor diagram for the AT Biochem research facility at 74 Great Valley Parkway, Malvern, PA. Radioactive materials will be utilized only in the laboratory area of this facility. Materials awaiting waste disposal will be kept in a secured area of the shipping/receiving area. All facilities are kept locked when not in use, and access is limited to the locked areas through limited key access. Neither the laboratory nor waste holding area has direct access to the public. All entrances to the laboratory and waste storage area will be posted in accordance with 10 CFR Parts 19, 20 and 21. Eating, smoking, drinking and the application of cosmetics in the controlled areas is strictly prohibited.

3. At enclosure 2 is a diagram of the laboratory, showing work stations. Supplies of plexiglas beta shielding and lead bricks and foil are kept on hand to ensure radiation exposure is kept as low as reasonably achievable.

4. Two each beta/gamma (Geiger type) and beta (pancake type) survey meter detectors with appropriate meters are kept on hand at all times. The only exception to this rule is when one of the instruments is being calibrated (once every six months, + 10 percent maximum variance, two points per scale separated by at least 50% of the full scale). In this situation, only one each of the beta/gamma and beta probes with appropriate meter(s) will be available.

5. All personnel working with or handling radioactive materials will be issued a whole body type film badge dosimeter. Personnel working with I-125 will receive monthly Thyroid scans and have samples of there urine analyzed by an appropriately certified testing laboratory. All radiation workers will receive semiannual physical examinations including blood analysis, to be conducted by competent medical personnel. Records of radiation exposure and bioassay results will be maintained by the RPO.

### Supplement E

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### 1. Reference Item 10, NRC Form 313.

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2. At enclosure 1 is the AT Biochem Standard Operating Procedure for the Radiation Safety Program.

### STANDARD OPERATING FROCEDURE for the UTILIZATION OF RADIOACTIVE MATERIALS

1. <u>PURPOSE</u> To present rules and procedures for the use of radioactive materials in research conducted at AT Biochem. To ensure that exposure of workers to ionizing radiation is kept as low as reasonably achievable (ALARA).

2. <u>SCOPE:</u> This SOP applies to all persons working with radioactive materials at AT Biochem.

3. <u>PROCEDURES</u>: The following procedures will be used as a guideline for the ionizing radiation protection program:

a. Acquisition:

(1) All requests for radioactive material will be approved by Dr. Shorr, the license Radiation Protection Officer (RPO) or his designated alternate. Orders will be limited to the minimum amount of radioactive material required for the given research project.

(2) Once approved by Dr. Shorr, orders for radioactiv materials will be placed by the purchasing agent/secretary.

(3) All shipment of radioactive material will be received at the loading dock by Mr. Kane, Technical Assistant and Manager of Shipping/Receiving/Production. All packages will be carefully inspected to ensure there is no damage to any containers holding radioactive materials and that only the appropriate isotope(s) at the proper activity and chemical form have been received.

(4) Radioactive materials awaiting use will be stored in the 4° C refrigerator or -20° C freezer as appropriate. These devices are clearly posted "Caution Radioactive Materials".

b. Utilization:

(1) All research involving the use of radioactive materials will be reviewed and approved by Dr. Shorr prior to start-up. Dr. Shorr will review the proposed research protocol to ensure that: (a) adequate radioactive materials for the project are on hand or can be ordered within the scope of the NRC license, (b) adequate shielding is available to ensure radiation exposure to workers is kept as low as reasonably achievable, and (c) adequately trained personnel are available to conduct the research in a safe and efficient manner. (2) All research involving the use of radioactive materials will be conducted behind appropriate shielding. For beta emitters (P-32 and S-35), plexiglas beta shielding is available and must be utilized. For the gamma emitter (I-125), lead foil and bricks are available for use and will be utilized.

(3) Liquid waste materials will be placed in the carboy container marked for this purpose. Each time material is placed into the carboy, it will be annotated on the log sheet on the carboy shield. Information will include isotope, activity, chemical form and date.

(4) Solid waste materials will be placed in the plexiglas boxes (beta sources) or the steel drum (beta and gamma) marked for this purpose. Each time material is placed into the solid waste container, it will be annotated on the log sheet at the container. Information will include isotope, activity, chemical/ physical form and date.

(5) Eating, smoking, drinking and the application of cosmetics in areas where radioactive material is used or stored is strictly prohibited.

c. Dosimetry:

(1) All personnel working with radioactive materials or entering the radioactive materials work and/ or storage areas will wear the company provided personnel dosimetry device (film badge). Badges are to be worn between the thigh and shoulder on the outermost garment.

(2) Badges are assigned to one person only for a given wearing period. Badges will never be shared by two or more persons.

(3) Visitors approved for entry to the radiation areas by Dr. Shorr will be issued a visitors film badge and must wear the badge at all times while in the radiation areas.

(4) Badges will be kept in the designated storage area only when not being worn. Badges will not be taken out of the building without the expressed permission of Dr. Shorr.

(5) Records of occupational exposure will be kept by Dr. Shorr. In accordance with Title 29, Code of Federal Regulations, Part 1910, annual summaries of radiation exposure will be given to each employee. (6) All users of I-125 will have a monthly thyroid scan and urine sample analysis. Results of these tests will be kept with the film badge records.

(7) All laboratory employees will have a semiannual physical including blood analysis with results of these physicals kept with the film badge records.

d. Surveys:

(1) All laboratory work area including floors will be surveyed weekly with both the beta/gamma (Geiger) survey meter and the beta (pancake) survey detector. Wipe test smears will also be taken of the work areas weekly.

(2) Personnel will immediately report any known or suspected spills of radioactive material to Dr. Shorr. Care will be given to minimize the spread of contamination to other persons and equipment. The beta/gamma and beta contamination instruments will be available at all times for emergencies. All clean-ups will be conducted under the supervision of Dr. Shorr.

e. Training:

(1) All new employees will be presented training on the proper techniques in safely handling radioactive materials and will know and understand all pertinent laboratory rules and regulations prior to commencing work involving radioactive materials.

(2) Periodic training of radiation workers, in accordance with Title 10, Code of Federal Regulations, Part 19 will be conducted by Dr. Shorr for all persons working with radioactive materials

### Supplement F

1. Reference Item 11, NRC Form 313.

2. Radioactive waste materials will be collected in appropriate waste containers located in the laboratory and the transferred to the waste storage area. Aquecus radioactive wastes will be held for radioactive decay until such time as they can be properly disposed of in the sanitary sewerage system in accordance with 10 CFR 20.303. Other radioactive waste materials will be held until disposed of in accordance with 10 CFR 20.301 (a) or (b).

### 170.31

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49 FR 2129

### PART 170 . FEES FOR FACILITIES AND MATERIALS LICENSES-

SCHEDULE OF FEES FOR MATERIALS LICENSES AND OTHER REGULATORY SERVICES-Continued

Category or matenats licenses and type of	Fee >
a construction of the second	
H Licenses assued oursuant to subpart A of Part 32 of this chapter to distrib- ute items containing byproduct mate- nal that require device review to per- sone exempt from the licensing re- quirements of Part 30 of the chapter	
except specific licenses authorizing reclatribution of items that have been authorized for distribution to persons exempt firms the licensing require- ments of Perf 30 vi the operations	
Application-New Icen ve	\$580
Renewal	\$230
Licenses issued pursue ( to exhaud	\$120
A of Part 32 of this chapter to distrib-	
ute Rems containing byproduct mate-	
that do not require device evaluation	
to persons exempt from the loansing	
ter, except for specific licenses su-	
thorizing redistribution of items that	
to persons exempt from the acenauou	
requirements of Part 30 of this chap-	
Application-New Icones	\$290
Renewal	\$230.
Amendiment	\$60.
B of Part 32 of this chapter to distrib-	
ute nems containing byproduct mate-	
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koensed under Pierts 31 or 35 of this	
chapter, except specific acenses au-	
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Application-New license	\$1,200
Renews	\$700
K Longer sever pursuant to automat	\$230.
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ute Name containing byproduct mote-	
that do not require sesied source	
end/or device review to persons gen-	
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ses authorizing redistribution of	
distribution to persons generally i-	
clansed under Parts 31 or 35 of thes	
Application-New license	\$290
Renewal.	\$230
Amendment	\$60.
sion and use of byproduct material	
request pursuant to Parts 30 and 33	
velopment that do not authorize com-	
mercuel distribution.	
Renews	\$700
Pomendment	\$120.
M Other toenses for pot "saloh and	
sugent to Part 30 of this chapter for	
research and development that do	
Application-New Institution	\$700
Renewal	\$460
Amendment	\$120.
other scenses scent for lest test	the second second
ing and waste dispose! pickup serv-	-
Application-New license	\$930
Renewal	\$930
Amendment	\$120

SCHEDULE OF FEES FOR MATERIALS LICENSES AND OTHER REGULATORY SERVICES- CONtinued

Category of materials acenses and type of fee 1	Feel
O Licenses for possession and use of byproduct material insued pursuant to Part 34 of the rhapter for industrial referenceship operations.	
Application-New license	\$700
Renewal	\$700
Ameridment	. \$230
P. All other specific byproduct material	
Acenses, except prose in categories	
Appleation-New iconse	\$2:0
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Amendment	\$60
A. Waste diaposal	1
A Licenses specifically authorizing the	1
Bouros material, or special nuclear material from other persons for the propose of commercial disposal by land bunal by the scenaee, or a	
censes authorizing contingency ator-	
age of low level radicactive waste at	10000
ROPTISES for training or deposed by	
incineration, packaging of residuos	
resulting from momeration and trans-	
ter of packages to another person	
authorized to receive or papose of	1000
Application	\$150
License	\$803,700
Renewal	\$285,600
Amendment	\$46.400
B Licenses specifically authorizing the	
Pouros maisse byproduct material.	
meterial from other persons for the	
purpose of packaging or repackaging	
the material. The loansee will de-	
pose of the material by transfer to	
or discose of the material	
Application-New koense	\$1,400
Renowal	\$930
Amendment	\$350
Liberaes epectrically authorizing the	
uct material source material or son-	
ciel nuclear material from other per-	
sons. The licensee will dispose of the	
material by transfer to another	
pone of the material	
Application-New Iscense	\$930
Renewal	\$480
Amendment	\$120
5. Wiali logging:	
A Licenses specifically authorizing rae	
B. B/O/D/ BDBCIR) PURIAR PORTAL IN	
well loging, well surveys, and tracer	
studies other than held flooding	
tracer studies	
Application-New scense	\$700
henewal.	\$700
P Linegage presidently a discussion use	\$170.
of byproduct material for field flood-	
IN TROP STUDIES	
Application	\$150.
Licens e	Full cost 5
American	Full cost *
Auchar burgener	Full cost a
A Licenses for commercial entertion	
and isundry of items contaminated	
with byproduct material, source mate-	
rial, or apecial nuclear material	
Application-New Incense	\$700
Ameriman	\$170
Humen use of byproduct enurce or	
abecial huciaal material	

SCHEDULE OF FEES FOR MATERIALS LICENSES AND OTHER REGULATORY SERVICES-Continued

Har 1	Fee *
A. Licenses resued pursuant to Parts 30, 40, and 70 of this chapter to human use of byproduct material, source material, or spocal nuclear material in seared sources contained in searer services. Application-New toonse Penewait Amend vent      E. Licenses of broad scope seared to medical matitutions or two or more physicians pursuant to Parts 30, 30, 35, 40, and 70 of the chapter author- timing human use of byproduct ma- chading human use of byproduct ma-	\$580 \$350. \$230.
terial, except locenses for byproduct material, source material, or special nuclear material in searce sources contained in telestherapy devices. Application-New locence Renewed. Amendment.	\$1,200. \$700. \$120.
C Other licenses resued pursuant to Parts 30, 35, 40, and 70 of the chapter for human use of byproduct material source material, except licenses for byproduct material, except licenses for byproduct material, except licenses for special nuclear material in sedet sources contained in setting	
BDy devices Application-New Lockse Renewal Amendment	\$580 \$580 \$120
A. Licenses for possession and use of hyproduct makenal, source material, or special nuclear material for civil defense activises. Application-New lacense Renewal. Ammidment.	\$290. \$230 \$60
<ol> <li>Device, product or sealed source asiety evaluation:</li> <li>A Safety evaluation of devices or prod- ucts containing byproduct material source material, or special nuclear material, except reactor, but rescent</li> </ol>	
for commercial distribution: Application—each device Amandmeni—each device \$ Salety evaluation of devices or prod-	\$1.600 \$500
Nource material or special nuclear material menufactured in accordance with the unique specifications of, and for use by a single applicant, excent reactor fuel devices Application—each device.	\$800
Amendmeni—each device C. Satety evaluation of sealed source: containing byproduct material, acuron material, or special nuclear material, except reactor fuel, for commercial distribution.	\$290
Application—each source Amandmoni—each source D. Salety evaluation of sealed sources containing byproduct material, source meterial, or special nuclear material, manufactured in accordance with the unique specifications of, and to reacto by a single applicant, accord reactor	\$350. \$120.
Appication-sach source	\$175.

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### LUDLUM GENERAL PURPOSE PORTABLE SURVEY METERS

Select survey meter, cable, dial and handle clip from this data sheet. Select detector from detector data sheet to construct analog survey meter for your specific requirements.

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Adjustable HV to 1500 Volts Scintillation or G-M Detectors

MODEL 12 4 Counting Scales Adjustable HV to 2500 Volts Adjustable Gain Threshold Proportional, Scintillation or G-M Detectors

MODEL 16 4 Counting Scales Adjustable HV to 2500 Volts Adjustable Threshold Adjustable Window with In/Out Switch Proporticisal, Scintillation or G-M Detectors

MODEL 18 4 Counting Scales Adjustable HV to 2500 Volts Fixed Threshold Adjustable Wir.Jow with In/Out Switch 3 Adjustable HV Settings Proportional, Scintillation or G-M Detectors

### UNIQUE SPECIFICATIONS

MODEL -2:

THRESHOLD: Fixed at 40±10mV. HV: Adjustable from 200-1500 volts. RESET: Push button to zero meter after over range exposure. STANDARD DIAL: 0-5K CPM and BAT OK. MULTIPLIER RANGES: X0.1; X1; X10. BATTERY LIFE: 200 hours typical. DETECTORS: Scintillation or G-M

MODEL 3:

THRESHOLD: Fixed at 40±10mV. HV: Adjustable from 200-1500 volts. RESET: Push button to zero meter after over range exposure. STANDARD DIAL: 0-5K CPM and BAT OK. MULTIPLIER RANGES: X0.1; X1; X10; X100. BATTERY LIFE: 200 hours typical. DETECTORS: Scintillation or G-M.

MODEL 12:

GAIN THRESHOLD: Adjustable from 2mV to 40mV HV: Adjustable from 200-2500 volts. RESET: Push button to zero meter after over range exposure. STANDARD DIAL: 0-500 CPM and BAT OK. MULTIPLIER RANGES: X1; X10; X100; X1K. BATTERY LIFE: 100 hours typical. DETECTORS: Scintillation, G-M or proportional.

MODEL 16:

THRESHOLD: Adjustable from 2mV to 40mV. WINDOW: Adjustable from 0 to 50% of threshold. WINDOW IN/OUT: Disables window. HV: Adjustable from 200-2400 volts. STANDARD DIAL: 0-500 CPM and BAT OK. MULTIPLIER RANGES: X1; X10; X100; X1K. BATTERY LIFE: 100 hours typical. DETECTORS: Scintillation, G-M or proportional.

MODEL 18:

THRESHOLD: Fixed at 5mV unless otherwise indicated to fit selected detectors.
WINDOW: Adjustable from 0 to 50% of threshold.
WINDOW IN/OUT: Disables window.
HV: Three settings available; each adjustable from 200-2400 volts.
STANDARD DIAL: 0-500 CPM and BAT OK.
MULTIPLIER RANGES: X1; X10; X100; X1K.
BATTERY LIFE: 100 hours typical.
DETECTORS: Scintillation, G-M or proportional.

MODEL 2A:

THRESHOLD: Fixed at 40±10mV. HV: Adjustable from 200-1500 volts. RESET: Push button to zero meter from over range exposure and reset alarm. STANDARD DIAL: 0-500 CPM and BAT OK. MULTIPLIER RANGES: X1, X10; X100. ALARM SET: Non indicating control adjusts alarm point between 10% and 120% of full scale. BATTERY LIFE: 200 hours typical. DETECTORS: Scintillation, G-M or proportional.

## THE GENERAL PURPOSE SURVEY METERS HAVE THE FOLLOWING COMMON SPECIFICATIONS

SIZE: 8.6(3.4")W by 15.5(6")H by 18(7")L.
WEIGHT: 1.6(3.6 pounds) including batteries.
CONSTRUCTION: Cast and drawn aluminum with beige polyurethane paint finish.
CONNECTOR TYPE: Series "C".
METER LINEARITY: ±3% of full scale.
CALIBRATION STABILITY: 3% of full scale to battery end point.
METER SCALE: 6.4(2.5") ARC.
AUDIO: Built in unimorph speaker with ON/OFF.

RESPONSE: Toggle switch for FAST (3 seconds) or SLOW (12 seconds), for 67% of full scale. BATTERIES: 2 each, size "D".

**TEMPERATURE RANGE:** ---15°C to +50°C standard operation. Below 5°C will require very fresh batteries or Ni Cds. Units may be certified for operation 1/9m ---40°C to +65°C with individual testing.

# BETA-GAMMA DETECTORS Also See Models: 3-98; 14C; 5; 6; 15; 19; 77; 316-2; 9; 17



DYNODE STRING: MODEL 112 dynode string (series "C" connector furnished unless otherwise requested) SIZE: 26.7 (10.5")L by 6.4 (2.5") diameter WEIGHT: 1.4 (3 pounds) FINISH: Anodized

Telex #466832 UD / 915-235-5494 / or write P.O. Box 810 / 501 Oak / Sweetwater, Texas 79556, U.S.A.

GM Survey Meter

4





- SMALL, LIGHTWEIGHT PACKAGE
- LONG BATTERY LIFE
- VARIABLE RESPONSE TIME

Eberline



E-120, E-120E

### Models E-120 and E-120E, Geiger-Mueller Survey Mete

### **GENERAL DESCRIPTION**

The Models E-120 and E-120E survey meters are compact, lightweight units with proven reliable electronics. A single printed circuit board contains most components, resulting in a minimum of solder joints. The printed circuit board connects to the cover allowing for removal of complete functioning electronics for ease of calibration.

The taut band meter provides exceptional readability. Variable response time is provided by a control knob on the cover. A built-in battery check is also provided. Low power circuits extend battery life. The instruments are operational from -40 °C to +60 °C with alkaline "D" cells installed.

The meter readout provided on the E-120 is marked in both mR/h and cpm graduations while the E-120E is marked only in cpm as listed in the specifications below. The instruments are identical otherwise. Although both the E-120 and E-120E will accommodate all available hand probes listed below, the E-120E was designed specifically for use with the Models HP-190A, HP-210AL, HP-210T, and HP-260 hand probe assemblies.

### SPECIFICATIONS

#### Range

E-120: Three linear ranges: 0.5, 5, 50 mR/h and 600, 6k, 60k cpm.

E-120E: Three linear ranges, 500, 5k, 50k cpm.

Display: Taut band meter with 2.37-inch (6 cm) scale length.

Response Time: Variable from 2 to 10 seconds to 90 percent of final reading.

**Linearity:** Within  $\pm 5$  percent of full scale when driven with a repetitive signal.

Battery Complement: Two "D" cells.

Battery Life: Nominal 300 hours C-Zn, 500 hours alkaline. The battery check is built-in.

Voltage Coefficient: Reading changes < 10 percent from new battery to end of battery life.

Connectors: BNC for detectors input. No. 5501 MP for headphones.

Construction: Splashproof, all metal case, enamel finish.

Temperature: Operational from -40 °C to +60 °C (-40 °F to 140 °F).

**Dimensions (including handle):** 3.38 inches wide, 6.75 inches long, 6.38 inches high (8.6 cm x 17.1 cm x 16.2 cm).

Weight: 2.7 pounds (1.22 kg with C-Zn batteries.

AVAILABLE ACCESSORIES Hand Probe Assemblies Model

HP-177C HP-190A HP-210AL HP-210T HP-260 HP-270

Connecting Cables (Instrument to Probe)

### Model

CA-10 coil cord (standard) CA-1-36, 36-inch coaxial (straight) CA-1-60, 60-inch coaxial (straight)

#### Speaker Assembly

Model SK-1 CA-9-5, cable required with SK-1 SK1-MK1, mounting kit required with SK-1

Audio Headset Assembly: Model BA201M

Carrying Strap: Part No. ZP10125099

Radioactive Check Source: CS-7A, gamma source

# Hand Probe Model HP-260





- THIN WINDOW "PANCAKE" GM
- HIGH BETA SENSITIVITY
- WINDOW PROTECTIVE SCREEN



HP-260

### Model HP-260, Hand Probe

### **GENERAL DESCRIPTION**

The Model HP-260 hand probe provides a sensitive beta detector, featuring a "Pancake" GM tube with a thin mica window. The open window, which is protected by a sturdy wire screen, permits useful beta sensitivities down to 40 keV. The detector is alpha sensitive above 3 MeV. The HP-260 is designed for contamination surveys on personnel, table tops, floors, equipment, etc.

The long handle on the HP-260 makes it convenient for personnel and table-top surveys.

### SPECIFICATIONS

Operating Voltage: 900 ± 50 V

Plateau Length: 100 V minimum

Plateau Slope: 0.1 percent per V maximum

Cead Time: 50 µs maximum

Temperature Range: - 22 °F to + 167 °F (- 30 °C to + 75 °C)

Mica Window Thickness: 1.4 to 2.0 mg/cm<sup>2</sup>

Mica Window Size: 1.75-inch-diameter (4.45 cm); 2.4 in<sup>2</sup> (15.5 cm<sup>2</sup>)

Gamma Sensitivity: ≈ 3600 cpm/mR/h (137Cs) (into window)

\*Beta Efficiency: ≅ 45 percent <sup>®0</sup>Sr-<sup>®0</sup>Y ≅ 30 percent <sup>®0</sup>Tc

≅ 10 percent 14C

Alpha Sensitivity: 3 MeV at window

Connector: BNC series coaxial

Size: 10 inches long x 2.75 inches wide x 2.5 inches high (25.4 cm x 7 cm x 6.4 cm)

Weight: 1.25 pounds (0.57 kg)

\*Efficiencies with screen in place. Screen removal will increase efficiency by  $\approx$  45 percent of stated value. Efficiencies listed as percentage of  $2\pi$  emission rate, from a one-inch-diameter source.

### AVAILABLE ACCESSORII S

Instruments	Cables
E-120	CA-1-36
E-140	CA-1-36
E-520	CA-1-36
MS-3	CA-16-6)
PRM-6	CA-16-6)
RM-14	CA-1-60
RM-20	CA-16-60
RM-21	CA-16-60



P.O. Box 2108 Santa Fe, New Mexico 87504-2108 (505) 471-3232 TWX: 910-985-0678



### Models HP-270 and HP-290, Hand Probes

### **GENERAL DESCRIPTION**

The HP-270 is an excellent general purpose GM probe, with energy compensation and a beta shield, making it the choice for most health physics applications. The energy compensation permits reliable exposure rate measurement from background to 200 mR/h. The HP-290 is a higher range GM probe with energy compensation, providing reliable exposure rate measurement from 0.1 mR/h to 10 R/h.

### SPECIFICATIONS

	HP-270	HP-290
Operating Voltage:	900 ± 50 V	550 ± 50 V
Plateau Length:	100 V minimum	100 V minimum
Plateau Slope:	0.1 percent per V maximum	0.2 percent per V maximum
Dead Time:	100 µs maximum	20 µs maximum
Temperature Range:	- 40 °F to + 167 °F (- 40 °C to + 75 °C)	- 40 °F to + 167 °F (- 40 °C to + 75 °C)
Wall Thickness:	30 mg/cm <sup>2</sup> (tube only)	90 mg/cm <sup>2</sup> (tube only)
Wall Material:	Stainless steel	Stainless steel
Gamma Sensitivity:	≅ 1200 cpm/mR/h ( <sup>i37</sup> Cs)	≅80 cpm/mR/h (137Cs)
Energy Response:	See curve	See curve
Housing:	ABS plastic	ABS plastic
Connector:	BNC series coaxial	BNC series coaxial
Size:	1 <sup>3</sup> /s inches in diameter x 6 inches long (3.5 cm x 15.2 cm)	1 1/2 inches in diameter x 31/2 inches long (2.9 cm x 8.9 cm)
Weight:	5 ounces (142 g)	2 ounces (57 g)

### AVAILABLE ACCESSORIES

HP-270		HP-290	
Instruments	Cables	Instruments	Cables
E-120	CA-1-36	E-530N	CA-1-36
E-140	CA-1-36	MS-3	CA-16-60
E-520	CA-1-36	PRM-5-3	CA-14-36
MS-3	CA-16-60	PRM-6	CA-16-60
PRM-5-3	CA-14-36	RM-20	CA-16-60
PRM-6	CA-16-60	RM-21	CA-16-60
RM-14	CA-1-60		
RM-20	CA-16-60		
RM.21	CA.16.60		



Energy Response of Models HP-270 and HP-290



		: (FOR LEMS USE) INFORMATION FROM LTS
BETWEEN:		
LICENSE FEE MANAGEMENT BRANCH, ARM AND		PROGRAM CODE: STATUS CODE: 3
REGIONAL LICENSING SECTI	SNS	EXP. DATE: 0 FEE COMMENTS:
LICENSE FEE TRANSMITTAL		
A. REGION		
1. APPLICATION ATTACHEC APPLICANT/LICENSEE: RECEIVED DATE: DOCKET NO: CONTROL NO.: LICENSE NO.: ACTION TYPE:	AT BIOCHEM 880502 3030570 108824 NEW LICENSEE	
2. FEE ATTACHED AMDUNT: 700.00 CHECK NO.: 784		
3. COMMENTS		
	SIGNED BE	25488
B. LICENSE FEE MANAGEMENT	BRANCH CCHECK	WHEN MILESTONE 03 IS ENTERED 141
1. FEE CATEGORY AND AMOU	INT: OM	\$700
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