MELPAR, INC. 7700 ARLINGTON BOULEVARD, FALLS CHURCH, VIRGINIA 22046
A SUBSIDIARY OF WESTINGHOUSE AIR BRAKE COMPANY

WABCO

25 July 1967

U. S. Atomic Energy Commission
Washington, D. C. 20545

Attention: Isotopes Branch, Division of Materials Licensing

Re: Byproduct Material License No.
45-7548-1 (G67) - RENEWAL

Gentlemen:

Enclosed herewith find application, executed in duplicate, for renewal of Melpar's Byproduct Material License No. 45-7548-1 (G67), which expires 31 July 1967.

This application for renewal is a consolidation of the original application and all supplementary applications.

We have substituted Stephen E. Bush, Safety Coordinator for Richard F. Andree (who has left the Company) as Radiation Protection Officer.

We have also substituted Joel R. Finkel, Scientist, for Joseph L. Bowles (who has left the Company), as a user of Atomic Numbers from 3 to 83, inclusive (6H).

The following "individual users" have left the Company and have been deleted from our renewal application: F. L. Aldrich, J. L. Carney, H. G. Eaton, G. B. Gori, V. R. Huebner, M. R. Kagan, K. J. Krost, L. F. Lott and Earl Usdin.

We are requesting the addition of J. H. Fossum as a licensed user of Hydrogen 3 (6D) and J. R. Finkel as a licensed user of Silver 110, 111 (6C), Krypton 85 (6E), Americium 241 (6F), Polonium 210 (6G) and Strontium 90 (6J).

In addition, please note that we have requested that Iron 55 (6M) be added to the authorized byproduct materials in our license with W. J. Patterson and J. R. Finkel as users.

If there is any further information you desire, we will be pleased to furnish it.

Very truly yours,

MELPAR, INC.

Austin G. Roe
Secretary and House Counsel

B-9

6/4 Reb

Form AEC-313
8-64
10 CFR 30

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE (RENEWAL)

Form approved.
Budget Bureau No. 38-R027

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application or an application for renewal of a license. Information contained in previous applications filed with the Commisson with respect to Items 8 through 15 may be incorporated by reference provided references are clear and specific. Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: U.S. Atomic Energy Commission, Washington, D.C., 20545, Attention: Isotopes Branch, Division of Materials Licensing. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20.

1. (a) NAME AND STREET ADDRESS OF APPLICANT. *(Institution, firm, hospital, person, etc. Include ZIP Code.)*

Melpar, Inc.
7700 Arlington Boulevard
Falls Church, Fairfax County
Virginia 22046

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. *(If different from 1 (a). Include ZIP Code.)*

1. Melpar Shirley Research Plant, Shirley Industrial Area, Springfield, Fairfax County, Virginia
2. 7700 Arlington Blvd., Falls Church, Fairfax County, Virginia 22046

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Research

3. PREVIOUS LICENSE NUMBER(S). *(If this is an application for renewal of a license, please indicate and give number.)*

#45-7548-1 (G67)
RENEWAL

4. INDIVIDUAL USER(S). *(Name and title of individual(s) who will use or directly supervise use of byproduct material. Give training and experience in Items 8 and 9.)*

See attached sheets #2 & 3

5. RADIATION PROTECTION OFFICER *(Name of person designated as radiation protection officer if other than individual user. Attach resume of his training and experience as in Items 8 and 9.)* See attached sheet #4

Stephen E. Bush
(Safety Coordinator)

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*	(b) CHEMICAL AND/OR PHYSICAL FORM AND MAXIMUM NUMBER OF MILLICURIES OF EACH CHEMICAL AND/OR PHYSICAL FORM THAT YOU WILL POSSESS AT ANY ONE TIME. *(If sealed source(s), also state name of manufacturer, model number, number of sources and maximum activity per source.)*
A. Carbon 14	A. Any - 400 millicuries
B. Phosphorus 32	B. Any - 100 millicuries
C. Silver 110, 111	C. Any - 5 millicuries each
D. Hydrogen 3	D. Any - 3 curies
E. Krypton 85	E. Any - 10 curies
F. Americium 241	F. Sealed sources (Monsanto Research Corp. foil) 800 microcuries total
G. Polonium 210	G. Sealed sources (Monsanto Research Corp. foil) 800 microcuries total
H. Atomic Numbers 3 to 83	H. Irradiated solid samples - 400 millicuries total
I. Hydrogen 3	I. Foil - 600 curies

(continued on Sheet # 1)

7. DESCRIBE PURPOSE FOR WHICH BYPRODUCT MATERIAL WILL BE USED. *(If byproduct material is for "human use," supplement A (Form AEC-313a) must be completed in lieu of this item. If byproduct material is in the form of a sealed source, include the make and model number of the storage container and/or device in which the source will be stored and/or used.)*

A. through E. - Laboratory tracer studies and laboratory research investigations.
F. through G. - Research in detection.
H. - Post-irradiation examination (non-destructive).
I. through K. - Development and use of gas chromatographic devices or systems.
L. - To be used as a tracer in the production of viral materials.
M. - To be used as radiation reference sources for the measurement of the life-time of proportional counters.

T-32
35308

(Continued on reverse side)

TRAINING AND EXPERIENCE OF EACH INDIVIDUAL NAMED IN ITEM 4 *(Use supplemental sheets if necessary)*

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection			Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments	See attached sheets #4 - 14		Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

9. EXPERIENCE WITH RADIATION. *(Actual use of radioisotopes or equivalent experience.)*

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
		See attached sheets #4 - 14		

10. RADIATION DETECTION INSTRUMENTS. *(Use supplemental sheets if necessary.)*

TYPE OF INSTRUMENTS (Include make and model number of each)	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE (mr/hr)	WINDOW THICKNESS (mg/cm^2)	USE (Monitoring, surveying, measuring)
See attached sheets #15-16					

11. METHOD, FREQUENCY, AND STANDARDS USED IN CALIBRATING INSTRUMENTS LISTED ABOVE.

See attached sheet #17

12. FILM BADGES, DOSIMETERS, AND BIO-ASSAY PROCEDURES USED. *(For film badges, specify method of calibrating and processing, or name of supplier.)*

See attached sheet #18

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS IN DUPLICATE

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. *(Circle answer)* (Yes) No Falls Church See attached sheets #19-22

14. RADIATION PROTECTION PROGRAM. Describe the radiation protection program including control measures. If application covers sealed sources, submit leak testing procedures where applicable, name, training, and experience of person to perform leak tests, and arrangements for performing initial radiation survey, servicing, maintenance and repair of the source.

See attached sheets #23-30

15. WASTE DISPOSAL. If a commercial waste disposal service is employed, specify name of company. Otherwise, submit detailed description of methods which will be used for disposing of radioactive wastes and estimates of the type and amount of activity involved. See attached sheets #31-32

CERTIFICATE (This item must be completed by applicant)

16. THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATE ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, 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.

Date 25 July 1967

MELPAR, INC.
Applicant named in item 1

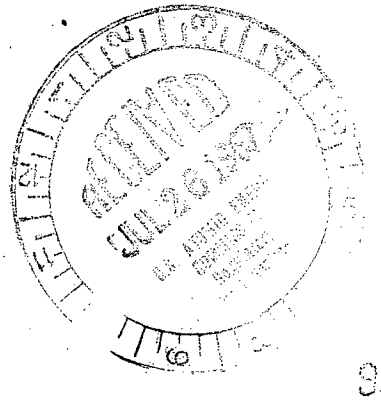
By J. P. Chambers
J. P. Chambers
Vice President
Title of certifying official

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.

* U.S. GOVERNMENT PRINTING OFFICE : 1964 O—745-381

Item 6. (continued)

(a) Byproduct Material	(b) Chemical and/or Physical Form and Maximum Number of Millicuries of Each Chemical and/or Physical Form
J. Strontium 90	J. Sealed sources (U. S. Radium foil) 40 millicuries total
K. Nickel 63	K. Sealed sources (U. S. Radium foil) 500 millicuries total - activity of each foil not to exceed 50 millicuries per square inch.
L. Sulfur 35	L. Any - 100 millicuries total
M. Iron 55	M. Sealed sources (Isotopes, Inc. foil) 7 millicuries total - activity of each foil not to exceed 1 millicurie.



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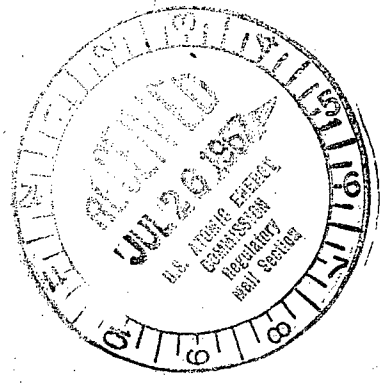
Items 4, 8 and 9

Item 4. Individual Users	Orig. Biog. Sketch filed with AEC	Byproduct Material Used
Sam S. Brody	Appln. 11/4/63	(6D) Hydrogen 3 (6K) Nickel 63
Joel R. Finkel	Appln. 2/20/67	(6C) Silver 110, 111 (6D) Hydrogen 3 (6E) Krypton 85 (6F) Americium 241 (6G) Polonium 210 (6H) Atomic numbers 3 to 83 inclusive (6I) Hydrogen 3 (foil) (6J) Strotium 90 (6K) Nickel 63 (6M) Iron 55
John H. Fossum	herewith	(6D) Hydrogen 3
William F. Hymes	Appln. 2/20/67	(6A) Carbon 14 (6B) Phosphorus 32 (6C) Silver 110, 111 (6D) Hydrogen 3 (6L) Sulfur 35
Douglas E. Lorenz	Appln. 3/14/66	(6A) Carbon 14 (6B) Phosphorus 32 (6D) Hydrogen 3 (6L) Sulfur 35
Joseph W. Paljug	Appln. 2/20/67	(6I) Hydrogen 3 (foil) (6K) Nickel 63
William J. Patterson	herewith	(6M) Iron 55

(continued --)

Item 4. Individual Users	Orig. Biog. Sketch filed with AEC	Byproduct Material Used
Dr. Vera R. Usdin	Appl. 1/18/63 - Ltr. 2/27/63	(6A) Carbon 14 (6B) Phosphorus 32 (6D) Hydrogen 3
Dr. John E. Verna	Appln. 3/14/66	(6A) Carbon 14 (6B) Phosphorus 32 (6D) Hydrogen 3 (6L) Sulfur 35

Item 8. Training)
) See attached sheets for each individual user
Item 9. Experience with Radiation)



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STEPHEN E. BUSH

Data with Respect to Training and Experience
(Reference: Items 5, 8 & 9, Form AEC-313)

Item 8. Stephen E. Bush, Safety Coordinator

B.A. - Social Sciences - Michigan State University
M.A. - Education - Colorado State College

Type of Training	Where	Duration	On the Job	Formal Course
a) Principles...	Melpar, Inc.	5 years	yes	no
b) Radioactivity...	Melpar, Inc.	5 years	yes	no
c) Mathematics...	Michigan State Chem. (12 credits) Physics (5 credits)	4 semesters	-	yes
d) Biological...	Michigan State Biology and Zoology (18 credits)	4 semesters	-	yes

Item 9. Experience with Radiation

Isotope	Max. Amt.	Where	Duration	Type of Use
H^3	1 C/in^2	Melpar, Inc.	5 years	Member of Radiation Safety Committee as Melpar Safety Engineer.
Ni^{63}	20 Mc/in^2	Melpar, Inc.	1 year	
H^3 Tritium	varies	Melpar, Inc.	5 years	
P^{32}	varies	Melpar, Inc.	5 years	
C^{14}, etc.	varies	Melpar, Inc.	5 years	
Cs^{137}	2000 C	Melpar, Inc.	3 years	

SAM S. BRODY

Data with Respect to Training and Experience
(Reference: Items 8 & 9, Form AEC-313)

Item 8. Sam S. Brody, Senior Chemist

B. S. - Chemistry - University of Chattanooga
M.S. - Organic Chemistry - University of Tennessee

Type of Training	Where	Duration	On the Job	Formal Course
a) Principles.....	Melpar, Inc.	2 yrs.	yes	no
b) Radioactivity...	Familiar with concepts but has not used instruments			
c) Mathematics...	M. S. Chemistry, Univ. of Tenn., E. I. Dupont, Orange, Texas	1 yr.	yes	yes
d) Biological.....	Melpar, Inc.	2 yrs.	yes	no.

Item 9. Experience with Radiation

Isotope	Max. Amt.	Where	Duration	Type of Use
H^3 Tritium	1 curie	Melpar, Inc.	4 yrs.	Electron capture ionization detector

(see also statement attached)

SAM S. BRODY, Organic and Analytical Chemist has a BS degree in Chemistry from the University of Chattanooga, (b)(6) and a MS degree in Organic Chemistry from the University of Tennessee, (b)(6)

Prior to joining Melpar, Mr. Brody was employed as a Development Chemist by E. I. DuPont De Nemours and Co. in Beaumont and Orange, Texas for 6 1/2 years, 1956-1963. His work at DuPont included research and development associated with nylon intermediates including: mechanism studies on the decomposition of hydroperoxides; mechanism studies on the nitric acid oxidation of adipic acid precursors; exploratory research on new routes to synthesis of nylon intermediates with a strong emphasis on catalyst scouting and vapor phase reactions; process development and plant assistance during the "start up" of a caprolactan plant; and analytical development in conjunction with all of the aforementioned. Ex6

Mr. Brody's analytical development experience included the use of liquid-liquid chromatography for the analyses of monobasic and dibasic acids, use of ion exchange resins, the use of ultraviolet, visible and infrared spectroscopy, flame photometry, wet chemical analyses, and gas chromatography for quantitative and qualitative analyses. His gas chromatography experience has been extensive and covers almost every area of the field.

Mr. Brody is a member of the American Chemical Society and Sigma Xi. He has one publication, "Structure and Reactions of Gossypol. V. Methylapogossypol hexamethyl ether and 2, 3-dimethoxy-4-isopropyl-5-allyltoluene," by D. A. Shirley, S. S. Brody and W. C. Sheehan, J. Or. Chem., 22, 495 (1957).

Mr. Brody's work at Melpar has been as Senior Chemist and as Supervisor of Detector and Kits Branch.

JOEL R. FINKEL

Data with Respect to Training and Experience
(Reference: Items 8 & 9, Form AEC-313)

Item 8. Joel R. Finkel, Scientist

B.S. - Chemistry - Roosevelt University
Post Graduate Studies - Purdue University (2 1/2 yrs.)

Type of Training	Where	Duration	On the Job	Formal Course
a) Principles...	Purdue University	2 1/2 yrs.	yes	yes
b) Radioactivity...	Purdue Univeristy	2 1/2 yrs.	yes	yes
c) Mathematics...	Purdue University	2 1/2 yrs.	yes	yes
d) Biological.....	Purdue University	2 1/2 yrs.	yes	yes

Item 9. Experience with Radiation

Isotope	Max. Amt.	Where	Duration	Type of Use
CO-60	10,000C	Aerojet-General Corp., Azusa, Calif.	2 1/2 yrs	R & D
C-14	3 C	"	2 1/2 yrs.	R & D
H^3	3 C	"	2 1/2 yrs.	R & D
Po-210	250 mc	"	1 year	R & D
Ra-226	3 C	"	1 year	R&D
Kr-85	500 mc.	"	1 year	R & D
Cs-137	2000 C	"	1 year	R & D

+ about 15 others.

JOHN H. FOSSUM

Data with Respect to Training and Experience
(Reference: Items 8 & 9, Form AEC-313)

Item 8. John H. Fossum, Senior Scientist

B.S. - Chemistry - University of Minnesota
Ph. D. - State University of Iowa

Type of Training	Where	Duration	On the Job	Formal Course
a) Principles...	State Univ. of Iowa	1 semester	yes	yes
	Commercial Solvents	3 months	yes	yes
b) Radioactivity...	Commercial Solvents	1 month	yes	yes
c) Mathematics...	State Univ. of Iowa	1 semester	no	yes
d) Biological.....	Honeywell, Inc.	1 month	yes	no
	Commercial Solvents	2 months	yes	no

Item 9. Experience with Radiation

Isotope	Max. Amt.	Where	Duration	Type of Use
C^{14}		Commercial Solvents Corp.	1 year	Tagged Dextran
Sr^{90}		Honeywell, Inc.	4 years	GC Source
H^{3}		Honeywell, Inc.	4 years	GC Source

WILLIAM F. HYMES

Data with Respect to Training and Experience
(Reference: Items 8 & 9, Form AEC-313)

Item 8. William F. Hymes, Senior Scientist

B.S. - Chemistry - Marshall University
M.S. - Biochemistry - West Virginia University
Ph.D. - Biochemistry - West Virginia University

Type of Training	Where	Duration	On the Job	Formal Course
a) Principles...	West Va. Univ.	1 1/2 yrs.	yes	yes
b) Radioactivity..	West Va. Univ.	1 1/2 yrs.	yes	yes
c) Mathematics...	Marshall University	3 years	yes	yes
	West Va. Univ.	1 1/2 yrs.	yes	yes
d) Biological.....	West Va. Univ.	6 months	no	yes

Item 9. Experience with Radiation

Isotope	Max. Amt.	Where	Duration	Type of Use
C^{14}	5 mc	West Va. Univ.	1 1/2 yrs.	In vivo

DOUGLAS E. LORENZ

Data with Respect to Training and Experience
(Reference: Items 8 & 9, Form AEC-313)

Item 8. Douglas E. Lorenz, Senior Scientist

Ph. D. - Microbiology, University of California

Type of Training	Where	Duration	On the Job	Formal Course
a) Principles...	U. C. L. A.	1 year	no	yes
b) Radioactivity...	U. C. L. A.	1 year	no	yes
c) Mathematics....	U.C. L. A.	1 year	no	yes
d) Biological.....	U. C. L. A.	1 year	no	yes
	Univ. of Minn.	1 year	yes	no

Item 9. Experience with Radiation

Isotope	Max. Amt.	Where	Duration	Type of Use
C^{14}	50 uc	U. C. L. A.	1 year	Metabolic studies
Co^{60}		U. C. L. A.	1 year	Detector standardization
Cs^{157}		U. C. L. A.	1 year	Detector standardization
I^{131}	10 uc	U. C. L. A.	1 year	Antibody labeling
P^{32}	10 uc	U. C. L. A. and Univ. of Minn.	2 years	Nucleic acid labeling
S^{35}	50 uc	U. C. L. A.	1 year	Metabolic studies

JOSEPH W. PALJUG

Data with Respect to Training and Experience
(Reference: Items 8 & 9, Form AEC-313)

Item 8. Joseph W. Paljug, Senior Electrical Engineer

B.A. - Physics - Washington & Jefferson College

Type of Training	Where	Duration	On the Job	Formal Course
a) Principles...	W&J College	1 year	no	yes
b) Radioactivity...	W&J College	1 year	no	yes
c) Mathematics...	W&J College	1 year	no	yes
d) Biological....	W&J College	1 year	no	yes

Item 9. Experience with Radiation

Isotope	Max. Amt.	Where	Duration	Type of Use
H^3	1.7 curies	Melpar, Inc.	2 years	Ionization Detector
Ni^{63}	.09 curies	Melpar, Inc.	2 months	Ionization Detector

WILLIAM J. PATTERSON

Data with Respect to Training and Experience
(Reference: Items 8 & 9, Form AEC-313)

Item 8. William J. Patterson, Principal Physicist

B.S. - Physics - University of Pittsburgh
Graduate Study - Physics - Syracuse University (6 credits)

Type of Training	Where	*Duration	On the Job	Formal Course
a) Principles...	Univ. of Pittsburgh	2 years	yes	yes
	General Electric	1 year	yes	yes
	Aberdeen Pv. Ground	1 year	yes	yes
b) Radioactivity...	Univ. of Pittsburgh	2 years	yes	yes
	General Electric	1 year	yes	yes
	Ballistics Research Labs., Aberdeen Proving Ground	1 year	yes	yes
c) Mathematics...	Univ. of Pittsburgh	4 years	yes	yes
	General Electric	2 years	yes	yes
	Melpar, Inc.	1 year	yes	yes
d) Biological....	Univ. of Pittsburgh	2 years	yes	yes
	General Electric	1 year	yes	yes

* Course work was concerned with the radiation hazards and preventive measures associated with the use of particle accelerators, particularly the cyclotron, Van DeGraff and Linear Accelerators.

Item 9. Experience with Radiation

University of Pittsburgh (approx. 2 years) - Some cyclotron work while an undergraduate student at the Sarah Mellon Scaife Radiation Laboratory on a part-time basis.

General Electric (approx. 6 months) - Theoretical work in some detail concerning the effect of nuclear weapon radiation on biological systems. Also, some work on the linear accelerator involved in setting up and operating the LINAC.

DR. VERA R. USDIN

Data with Respect to Training and Experience
(Reference: Items 8 & 9, Form AEC-313)

Item 8. Dr. Vera R. Usdin, Senior Scientist

Ph. D. - Ohio State University

Type of Training	Where	Duration	On the Job	Formal Course
a) Principles...	Univ. of Pa.	3 years	yes	no
b) Radioactivity...	Univ. of Pa.	3 years	yes	no
c) Mathematics....	Univ. of Pa.	3 years	yes	no
d) Biological.....	Univ. of Pa.	3 years	yes	no

Item 9. Experience with Radiation

Isotope	Max. Amt.	Where	Duration	Type of Use
H^3	15 c	Rhom & Haas Co.	3 years	Biochemical Res.
C^{14}	100 mc	Rhom & Haas Co.	3 years	Biochemical Res.
H^3	1 c	New Mexico Highlands University	3 years	Biochemical Res.
C^{14}	10 mc	" "	3 years	Biochemical Res.
P^{32}	10 mc	" "	3 years	Biochemical Res.
S^{35}	10 mc	" "	3 years	Biochemical Res.

(Also served as radiation control officer at New Mexico Highlands University for 2 years - 1960-62)

H^3 Tritium	Milli-curies	Melpar, Inc.	2 1/2 yrs.	Enzymatic studies
P^{32}	micro-curies	Melpar, Inc.	2 1/2 yrs.	In vitro tracer work
C^{14}	micro-curies	Melpar, Inc.	4 1/2 yrs.	In vitro tracer work

DR. JOHN E. VERNA

Data with Respect to Training and Experience
(Reference: Items 8 & 9, Form AEC-313)

Item 8. Dr. John E. Verna, Senior Scientist

Ph. D. - Biology, Brown University

Type of Training	Where	Duration	On the Job	Formal Course
a) Principles.....	Northeastern Univ.	1 year	-	yes
b) Radioactivity...	Brown University	1 year	Lab	yes
	Univ. of Minn.	2 years	Lab	no
c) Mathematics...	Northeastern Univ.	2 years	-	yes
d) Biological.....	Brown University	1 year	-	yes
	Univ. of Minn.	3 years	Lab	-

Item 9. Experience with Radiation

Isotope	Max. Amt.	Where	Duration	Type of Use
P^{32}	10 mc.	Univ. of Minn.	3 years	Virus labeling
S^{35}	110 mc.	Melpar, Inc.	6 months	virus labeling
H^{3}	100 mc.	Melpar, Inc.	1 year	Virus labeling

Item 10. Radiation Detection Instruments

(a) Logarithmic Survey Meter. Baird-Atomic #414
1 available.
Detects beta, gamma, x-rays.
Ranges - 3-300 mr/hr.
300-3000 mr/hr.
Window thickness - .9 mg/cm^2.
Used for measuring and monitoring.

(b) End window flow counter in geiger or proportional regions.
1 available.
Detects beta and gamma.
The combined unit consists of the following:
Baird Atomic Flow Counter Model 821B
Baird Atomic Proportional Amplifier Model 255
Baird Atomic High Voltage Power Supply Model 319
Baird Atomic Glow Tube Scaler Model 131A
Baird Atomic Scintillation Detector Model 810B.
Range: 0- 1 x 10^7 counts.
Window thickness - 0.7 mg/cm^2.
Used for measuring the activity of Smears.

(c) Tritium Monitor from Atomic Accessories, Inc.
Model TSM-91A.
Detects tritium, C^{14}, and other low energy beta emitters.
Sensitivity 0-10^2, 0-10^3, 0-10^4/0-10^5 microcuries of tritium per cubic meter of air. (Conversion factors are applied to meter readings for other radioactive gases such as C^{14} and Krypton-85).
Instrument will be used for monitoring.

(d) Model 2612 count rate meter with Model P-16 probe and Model D-35 end window counter from Nuclear-Chicago Corp.
Detects alpha, beta and gamma radiation.
Sensitivity - three ranges cover radiation intensities of .2, 2, and 20 mr/hr, full scale corresponding to 600, 6000, and 60,000 counter per minute.
Window thickness is 1.4 mg/cm^2.
Instrument to be used for surveying and measuring.

(e) Victoreen Fallout Detection Meter, Model No. 61720.
3 available.
Detects beta and gamma;range 0-5, 0-50, 0-500 r/hr.
Instruments will be used for emergency monitoring
in the event of high level contamination.

(f) Nuclear-Chicago portable rate meter, Model #2650.
1 available.
Detects beta and gamma
Range 0.2, 2, and 20 mr/hr. full scale.
Window thickness 1 mg/cm^2.
Instrument to be used for monitoring and surveying.

(g) Packard 314E Automatic Liquid Scintillation Spectrometer.
1 available.
Range to 10^6 counts.
Detects low energy beta as well as alpha and gamma.
Instrument to be used for measuring.

Item 11. Method, Frequency, and Standards Used in Calibrating Instruments

Calibrated Beta Source Set - Atomic Accessories Model SCB1225, Absorber set model AB-23, atomic accessories.

(a) The survey meter utilizes a built-in standard so that in adjusting the meter for use (whenever someone is in the laboratory) the operator must pass a calibration stage. Also a radiation standard is available.

(b) Calibrated by using C^{14} standards once every three (3) months.

(c) Will be calibrated weekly by its response to ionization produced by alpha particles emitted from the surface of a calibrated source.

(d) Equipped with calibrated reference source. To be calibrated at least once a week.

(e) Equipped with calibrated reference source. Will be calibrated as needed.

(f) Equipped with calibrated reference source. Will be calibrated as needed and at least once every 6 months.

(g) Equipped with calibrated reference source, H^3, C^{14}, and CL^{36}. Calibrated each time instrument is used.

Item 12. Film Badges, Dosimeters, and Bio-Assay Procedures Used.

I. Personnel Monitoring

A. Film Badges

Film badges which will record Beta, Gamma, and X-Ray are used to monitor personnel exposure on a monthly basis. If necessary, due to higher quantity of material or higher exposures on a monthly basis, a weekly or bi-monthly schedule will be instituted.

Our film badge supplier is currently "R. S. Landauer Jr. & Co." If another supplier is used, his service will be at least equal to R. S. Landauer Jr. & Co.

Film badge reports will be sent to Melpar on the same time basis as the wearing of the badges.

The film badge report will contain all of the information required on Form AEC-5, and will be used in lieu of Form AEC-5.

B. Pocket Dosimeters

Pocket dosimeters are available for all radioactive material workers depending on the material with which they are working.

Pocket dosimeters are routinely used (in duplicate) by all employees and visitors who enter the Radiation Lab at Falls Church.

The dosimeters available (38) are Bendix Model #862, 0-200mr self readers.

C. Bio-assay

Bio-assays where necessary or desirable in order to determine exposure or extent of exposure will be available. The bio-assay will be done either by Melpar-trained personnel or submitted to a qualified service.

Item 13. Facilities and Equipment

Falls Church Plant -- Radiochemistry Laboratory

The Radiochemistry-Radiation Chemistry Laboratory is located in the basement of Melpar's Falls Church Plant. A floor plan of this laboratory complex is attached.

As indicated in the drawing, the laboratory complex is bounded on three sides by floor-to-ceiling 4 inch stud walls, and on two sides by below-ground basement walls. The floors are covered with asphalt tile and the bench tops are continuous stainless steel or quarried stone. The laboratory is equipped with a Hamilton fume hood with 700 c.f.m. direct exhaust. The hood features a sink and front mounted controls for water, air, gas and vacuum.

One of the two access doors is a crash door that can be opened only from the inside. The main entrance is fitted with a bolt lock for which key blanks are available only from the manufacturer. This door is locked when there are no assigned personnel in the laboratory.

Visitors (including employees who are not authorized to work in this laboratory) are not permitted to enter except when escorted by Radiochemistry Laboratory personnel. A log of visitors and exposures received by them, if any, is maintained. Visitor exposures are monitored by pocket dosimeters worn in duplicate. Keys to the laboratory are distributed only to research personnel assigned to the laboratory, to the Radiation Protection Officer, and to certain highly responsible administrative officers. One key has been assigned to the head of the security guard and one key is located in a break-front box beside the laboratory door to provide emergency access.

A fire-check station is located beside the break-front box, and guards are instructed to check the status of the box when they make their fire inspection rounds. County fire companies and the county fire marshall have been informed of the conditions and special hazards of this laboratory. They are kept informed of any new special-hazard installations in the laboratory. In the event of an emergency during non-scheduled work hours, security guards have been instructed to telephone a radiological professional staff member assigned to the laboratory. All of these persons live within a five-mile radius of the laboratory and all are kept aware of the current work being performed in the laboratory.

The laboratory equipment includes the following items:

1. Radioactive storage area, including lead bricks and lead carrying case for anticipated use with nuclear materials.

2. Stainless steel waste container with plastic bags for dry wastes.

3. Remote pipettes.

4. Large Lucite box for storing C^{14} byproduct materials.

5. Mettler Type S6 Balance (Detects 10^{-6} grams).

6. Melpar fabricated dry box and vent--used for welding tritium foils.

7. Tracerlab DK Kit -- available for emergency decontamination of the laboratory.

Shirley Research Plant

A 15' x 9' x 9' Radioisotope Storage and Counting Room has been provided at Melpar's Shirley Highway Research Plant. This room is locked at all times and one of Melpar's "Licensed Users" in this plant has been assigned responsibility for controlling access to this room. This room has asphalt tile floors and formica bench tops.

Equipment in the Radioisotope Storage and Counting Room includes the following:

1. Fume Hood -- This is a 6 ft. hood which exhausts through a CBR filter system. This hood is also equipped with an audio-visual alarm to give warning any time the face velocity drops below 135 linear feet per minute. The hood is connected to the emergency power source.

2. Packard 314E Automatic Liquid Scintillation Spectrometer (has a built-in calibration standard).

3. Nuclear Chicago-BG Portable Meter, Model #2650 (standard included with meter).

4. Vanguard Auto Scanner 880 Gas Proportional Counter.

(b)(4)

Ex 4

Sheet #22

Item 14. Radiation Protection Program

I. Radiation Safety Committee

II. Key Personnel

A. Radiation Protection Officer (responsibilities)

B. Individual User (responsibilities)

C. Additional personnel involved in the Radiation Safety Program

1. Supervisor of the Radio-Chemistry Lab
2. Company Safety Engineer
3. Medical Department

III. Monitoring

A. Personnel Monitoring (see Item 12)

B. Laboratory Monitoring

1. Contamination Surveys
2. Swipe Surveys
3. External Radiation Surveys
4. Air Samples

C. Source Monitoring - Sealed Sources

IV. General Radiation Safety Procedure

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V. Procurement and Accountability

A. Procurement

B. Accountability

VII Storage & Labeling

A. Permanent Storage Location

B. Temporary Storage

Item 14. Radiation Protection Program

I. Radiation Safety Committee

A Radiation Safety Committee, composed of the Director of Research, Head of the Research Division Administrative Staff, Supervisor of the Radio-Chemistry Lab (or their designees), Company Safety Engineer and the Radiation Protection Officer, will review and approve, in advance of their purchase, all requests for radioisotopes.

II. Key Personnel

A. Radiation Protection Officer

The Radiation Protection Officer will be responsible for:

1. Furnish consulting services on all aspects of radiation use and protection.

2. General surveillance of the entire Radiation Protection Program as outlined in this license application, as required by 10 CFR, all applicable parts and the applicable state requirements.

3. Distribution and processing of personnel monitoring equipment (re: film badges, dosimeters, etc.)

4. Indoctrination of personnel in the proper use of radioactive materials.

5. Supervision and coordination of the waste disposal program, including the monitoring of disposal records.

6. Insuring the proper storage of all radioactive materials not in current use.

7. Maintaining the accountability records of radioactive material.

8. Supervising and monitoring decontamination operations.

9. A continuous program of environmental radiation hazard evaluation and hazard elimination.

10. Radiation monitoring through the use of swipes, portable meters, and air sampling.

11. Annual physical inventory of all radioactive material.

12. Drafting all applications for Byproduct materials prior to submission to the House Counsel.

B. Individual User

The responsible individual user as defined in our application(s) will be responsible for:

1. Submission of all requests for radioactive material to the Radiation Safety Committee through the Radiation Protection Officer.

   (a) The request will include, but will not be limited to the following:

   (1) Radioisotope and radiation properties
   (2) Maximum quantity needed
   (3) Concentration
   (4) Chemical form
   (5) Physical form
   (6) Purpose (use of the radioisotope) including a flow chart
   (7) Handling procedures
   (8) Storage
   (9) Waste disposal
   (10) Personnel involved
   (11) Location and equipment involved

2. Adequate planning before using radioactive materials.

3. Instructing employees (in conjunction with the Radiation Protection Officer) for whom he is responsible, in the use of safe techniques and in the application of approved radiation safety practices.

4. Reporting to the Radiation Protection Officer information concerning individuals and activities in his areas, particularly changes in his personnel roster.

5. Reporting to the Radiation Protection Officer whenever major changes in operational procedures, new techniques, alterations in the physical plant, or new operations are anticipated.

6. Complying with 10 CFR, all applicable parts.

7. Complying with all Company safety rules and procedures.

8. Maintaining records of all receipts, transfers, losses, and disposals of radioisotopes issued to him.

C. Additional Personnel Involved in the Radiation Safety Program

1. Supervisor of the Radio-Chemistry Lab

The supervisor of the Radio-Chemistry Lab will be responsible for controlling access to the Radiation Laboratory at the Falls Church Plant. He will not permit any use of radioactive materials in this laboratory unless such operations are supervised by a licensed (individual) user.

2. Company Safety Engineer

The Company Safety Engineer will work closely with the Radiation Protection Officer in such areas of monitoring, invantory, accountability, etc. In addition, he will be a member of the Radiation Safety Committee.

3. Medical Department

The full-time Industrial Nurse (RN) and part-time medical consultant will give advise regarding any medical problem concerning the Radiation Safety Program.

III. Monitoring

A. Personnel Monitoring - See Item 12.

B. Laboratory Monitoring

1. Contamination surveys will be conducted periodically in those areas where portable instruments will detect surface contamination, both fixed and transferable.

2. Swipe surveys will be conducted periodically in those areas where portable instruments will not detect surface contamination.

3. External radiation surveys will be conducted both periodically and also whenever it is necessary to monitor an operation.

4. Air samples will be collected in environmental areas during operation and also from stack effluents when appropriate.

III. Monitoring (continued):

C. Source Monitoring - Sealed Sources

A. Each sealed source containing byproduct material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for leakage and/or contamination at intervals not to exceed six months, except that each source designed for the purpose of emitting alpha particles shall be tested at intervals not to exceed three months. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, the sealed source shall not be put into use until tested.

B. The test shall be capable of detecting the presence of 0.005 microcurie of radioactive contamination on the test sample. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is permanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.

C. If the test reveals the presence of 0.005 microcurie or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five days of the test with the Director, Division of Licensing and Regulation, U. S. Atomic Energy Commission, Washington, D. C. 20545, describing the equipment involved, the test results and the corrective action taken. A copy of such report shall also be sent to the Director, Region II, Division of Compliance, USAEC, 50 Seventh Street, Northeast, Atlanta, Georgia.

D. Tests for leakage and/or contamination shall be performed by the licensee or by other persons specifically authorized by the Commission to perform such services.

IV. General Radiation Safety Procedures

A. Instruction of Personnel

As noted in Item 14, Sec. II, Key Personnel, responsibilities of the Radiation Protection Officer and responsibilities of the Individual User, these two individuals have the responsibility to insure that each employee working with radioactive materials is thoroughly indoctrinated and trained.

Some of the items the worker will be taught and trained in are:

1. What is radiation
2. Types of radiation
3. Personnel protection
4. Personnel monitoring
5. Approved handling procedures
6. Emergency procedures

B. Laboratory Practices

Besides the required radiation safety practices that are common to laboratories dealing with radioactive materials, such as time, distance, shielding, and quantity to reduce to a minimum radiation exposure, the following good industrial hygiene practices will be followed in those laboratories handling radioactive materials.

1. Smoking, drinking, or eating in any laboratory containing radioactive materials is prohibited.

2. Food will not be kept in any refrigerator containing radioactive materials.

3. Pipetting by mouth is prohibited.

4. Cuts or skin lesions must be reported to the dispensary.

V. Procurement and Accountability

A. Procurement

As noted in Item 14, I. Radiation Safety Committee, all requests for radioisotopes will be approved prior to Melpar Procurement.

The individual user will submit a written request to the Radiation Safety Committee through the Radiation Protection Officer. This request will include, but will not be limited to the following:

1. Radioisotope and radiation properties
2. Maximum quantity needed
3. Concentration
4. Chemical form
5. Physical form
6. Purpose (use of the radioisotope) including a flow chart
7. Handling procedures
8. Storage
9. Waste disposal
10. Personnel involved
11. Location and equipment involved

B. Accountability

The Radiation Protection Officer will keep accountability records of all licensed material. These records will show, for each radioisotope, date and quantity received, quantity shipped, disposal (including method) and a running balance.

The running balance will insure that the quantity on hand will not exceed that amount specified for each radioisotope noted in the license.

For waste disposal, see Item 15.

VI. Storage and Labeling

All radioactive materials will be clearly labeled as required by 10 CFR 20 giving pertinent and accurate information about the contents as well as identifying the person responsible.

EXCEPTION to this will be the following:

In lieu of using the conventional radiation caution colors (magenta or purple on yellow background) as provided in Section 20, 203(a)(1), Title 10, Code of Federal Regulations, Part 20, the licensee may label (Jarrell-Ash Co.) detector cells and cell baths, containing byproduct material and used in (Jarrell-Ash Co.) gas chromatography devices, with conspicuous etched or stamped radiation caution symbols without a color requirement.

A. Permanent Storage Location

1. The permanent storage location will be maintained within the Radiochemistry Laboratory.

2. It will be conspicuously posted with signs designating the area as a radiation storage area.

3. Radiation from the permanent storage area will not exceed 1 mr/hr. to any work area.

B. Temporary Storage

1. Each laboratory handling radioactive materials will have a temporary storage area.

2. Each area will be so marked.

3. Radiation dose rate outside the storage area will not exceed 1 mr/hr.

Item 15. Waste Disposal

A. Waste Containers

To insure that solid and liquid radioactive waste is kept separate, each laboratory handling radioisotopes will have (properly marked) a solid dry waste container and a liquid waste container.

1. The solid waste container will contain a polyethylene liner.

2. At the bottom of the liner, several pounds of an absorbent material will be placed.

3. Small quantities of liquid may be placed in the dry waste container provided the liquid is in leak proof containers.

4. Glass or ceramic bottles will be used for liquid waste. If the liquid waste container is glass or ceramic, it will be kept in such a manner that if accidently broken, the contents will be contained in a collecting pan.

5. All waste containers will be marked "Radioactive Waste."

6. All dry waste containers will have a drum log attached.

B. Waste Pickup

Whenever a container is full, drum or bottle, the Radiation Protection Officer will take possession and do the following:

1. Survey the container for external radiation.

2. Survey the container for contamination.

3. Determine the quantity of radioactive material in the container through the use of the drum log or actual sampling.

4. Disposal will be accomplished by one of two means noted below.

Item 15. (continued)

C. Waste Disposal

1. Solutions of radioactive material (not solids or suspensions) will be discharged into the sewer so as not to exceed the levels noted in 10 CFR, Title 20. Melpar routinely discharges an average of 10^6 gallons/month of water to the sewage system.

2. Solids or suspension in liquids will be filtered and treated as solids or put into solution and treated as in 1 above.

3. Solid radioactive material will be disposed of through an AEC-approved disposal service. We are currently using Tracerlab Radioactive Waste Disposal Service, 1601 Trapelo Road, Waltham, Massachusetts.

4. All shipments will conform to ICC Regulations.

5. All disposal will be recorded as noted in Item 14, Section V, Procurement and Accountability.