



UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS

P. O. BOX 8361, SOUTH CHARLESTON, W. VA. 25303

Reference File Number: 7820530

Date: July 27, 1978

US Nuclear Regulatory Commission
Radioisotopes Licensing Branch
Division of Fuel Cycle and Material Safety
Washington, DC 20555

Gentlemen:

This letter is in response to your notice of June 28, 1978, concerning expiration of our byproduct license. We wish to renew our license (#47-00260-02) and continue our radioisotope program.

We wish to be authorized to install and service specific or generally licensed gauges containing byproduct material at Union Carbide Corporation plants throughout the United States except in Agreement States as defined in Section 30.4(C), Title 10, Code of Federal Regulations, Part 30.

To assure that all governmental regulations are followed and that employee and public safety is assured, the Technical Center has an established, stringently enforced Radiation Protection Program. This program is described in the enclosed Technical Center Radiological Control Manual.

Also enclosed are NRC Form 313 and supplementary attachments, and the renewal fee of \$110. Your early approval of this application would be greatly appreciated. If there are any questions, or if further information is desired, please contact me at (304) 747-5412.

Very truly yours,

F. P. Straccia
Alternate Radiation Protection Officer
Measurement and Control Technology
CHEMICALS AND PLASTICS

FPS:sgm
Enclosures

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Act, exemptions 6
FOIA- 2007-0179

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UNITED STATES ATOMIC ENERGY COMMISSION
APPLICATION FOR BYPRODUCT MATERIAL LICENSE

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 Commission 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: Materials Branch, Directorate of 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, and the license fee provisions of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 16 and the appropriate fee enclosed. (See Note in Instruction Sheet).

1. (a) NAME AND STREET ADDRESS OF APPLICANT. (Institution, firm, hospital person, etc. include ZIP Code and telephone number.)
Union Carbide Corporation
Chemicals and Plastics - Measurement
and Control Technology
P. O. Box 8361
South Charleston, WV 25303 (304) 747-5414
Attn: Mr. R. V. Sealey

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. (If different from 1(a). Include ZIP Code.)
Union Carbide Corporation
Technical Center
Kanawha Turnpike
South Charleston, WV 25303
(See Attachment 1)

2. DEPARTMENT TO USE BYPRODUCT MATERIAL
Special Instrumentation Development Group
Measurement and Control Technology

3. PREVIOUS LICENSE NUMBER(S). (If this is an application for renewal of a license, please indicate and give number.)
47-00260-02 (for renewal) *3K 8/78*

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.)
R. V. Sealey J. A. Boguess
C. R. Landfried W. K. Becher
W. S. Kennedy D. G. Allport
M. E. Cavender F. P. Straccia
M. L. Green

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.)
R. V. Sealey
F. P. Straccia (Alternate)

6. (a) BYPRODUCT MATERIAL. (Elements and mass number of each.)
A. Cesium-137
B. Americium-241
C. Strontium-90
D. Strontium-90
E. Cobalt-60
F. Americium-241

(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. Sealed Sources, 300 curies total.
B. Sealed Sources, 20 curies total, no source exceeds 5 curies.
C. Sealed Sources, 5 curies total.
D. Sealed Source, 160 millicuries.
E. Sealed Source, 1 millicurie.
F. Sealed Source, 0.1 microcurie.

Unless otherwise stated, no source exceeds the rated capacity of its source holder (see Attachment 2 for source holder list).

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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, B, and C. Development, application, installation, and maintenance of measurement and control devices.
D. To be used in gas chromatography units for sample analysis.
E and F. Instrument calibration.

Applicant

Check No.	<i>247587 / 248441</i>
Amount/Fee	<i>110.00 + 4.40</i>
Type of Fee	<i>Renewal / Pen</i>
Date Check Rec'd	<i>8/2/78 / 8/25/78</i>
Received By	<i>Jackson Jackson</i>

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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)	
			Yes	No	Yes	No
a. Principles and practices of radiation protection	(See Attachment 3)		Yes	No	Yes	No
b. Radioactivity measurement standardization and monitoring techniques and instruments			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 Attachment 3)				

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 Attachment 4)					

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

See Technical Center Radiological Control Manual, Chapter VIII

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

R. S. Landauer Jr. & Co. film badge service.

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 See Radiological Control Manual, Chapter XI

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 Radiological Control Manual

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. Chem Nuclear Services

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.

License Fee Category: 110 (3L)

Fee Enclosed \$ 110

Date July 27, 1978

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RECEIVED

Union Carbide Corporation
Applicant named in item

By: R. D. Stief
Director of Engineering
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.

ATTACHMENT 1

Union Carbide Corporation, Technical Center, Kanawha Turnpike, South Charleston, West Virginia 25303, and at temporary job sites of the licensee anywhere in the United States where the USNRC maintains jurisdiction for regulating the use of byproduct material. This condition does not prohibit use in agreement states (as defined in Section 30.4(c), 10 CFR 30) under reciprocity procedures which may be established by those states.

ATTACHMENT 2

<u>Byproduct Material</u>	<u>Manufacturer</u>	<u>Source Encapsulation</u>	<u>Safety Holder</u>
A. Cesium-137	Ohmart Corp.	A-2102,A-2103,A-2104 A-2099,A-2095,A-2097	SHRM,SHRH,SHRD, SHRM-PA,SHRH-A, HM-8,SR-1,SR-2, ASR,LASR,ES-2,ES-3, ES-4,SHLG-1,SHLG-2, SHLG-3
		A-5771	SHRH,SHRM,SHLM
		3M4P6T A-5776	SHRD RTSN,RTSP,CC
	Texas Nuclear (Nuclear Chicago)	RR-138,A/S850233, 850263,3M4P6M, TN570-57157C, 3M4P6E	5182,5182A,5183, 5183A,5188,5189,5190, 5191,5192,5193,5084, 5086,5088,5174,5175, 5176,5186,5178, 5178A,5179,5179A, 5180,5180A,5181, 5181A
	Amersham/Searle	850233	Kay Ray Model 7062
	Industrial Nucleonics	BB-S-10053,BB-S-10051, BB-S-10062,BB-S-11063	LS-101,LS-102
	US Radium	LAB-236,LAB-11C, LAB-11D,LAB-236CL-4, LAB-236CL-5	
B. Americium-241	Monsanto Research Corp.	MRC-N-SS-W-AmBe, 2426,2722-BT	To be stored in a polyethylene filled steel vessel.
	Texas Nuclear Corp.	5010	570-579-103
	Ohmart Corp.	Monsanto Research Corp. Model 24-134	Ohmart Bulk Moisture Gauge
C. Strontium-90	Industrial Nucleonics	BB-0019-3, BBS-10072,BBS-10073	DH-2,DH-3
	US Radium	LAV-207B	Numinco Corp. SH-1A
D. Strontium-90	US Radium	Model LAB 369 Chromatographic Cell	
	Barber-Coleman	RS-3369	
	US Nuclear	C-5	
E. Cobalt-60	Tracerlab	R31-1	Hermetically sealed source in a lead- filled source holder
F. Americium-241	Monsanto Research Corp.	Model MRC-A-SS-W-Am-601	Cardboard box 95757


D. G. ALLPORT

<u>TYPE OF TRAINING</u>	<u>WHERE TRAINED</u>	<u>DURATION OF TRAINING</u>	<u>ON THE JOB</u>	<u>FORMAL COURSE</u>
a. Principles and practices of radiation protection	Georgia Institute of Technology	2 Weeks	No	Yes
	Union Carbide Technical Center, WV RPO School	1 Week	Yes	Yes
	Morris Harvey College, Charleston, WV	4 Years	No	Yes
b. Radioactivity measurement standardization & monitoring techniques & instruments	Georgia Institute of Technology	2 Weeks	No	Yes
	Union Carbide Technical Center, WV RPO School	1 Week	Yes	Yes
	Morris Harvey College, Charleston, WV	4 Years	No	No
c. Mathematics & calculations basic to the use & measurement of radioactivity	Georgia Institute of Technology	2 Weeks	No	Yes
	Union Carbide Technical Center, WV RPO School	1 Week	Yes	Yes
	Morris Harvey College, Charleston, WV	4 Years	No	No
d. Biological effects of radiation	Georgia Institute of Technology	2 Weeks	No	Yes
	Union Carbide Technical Center, WV RPO School	1 Week	Yes	Yes
	Morris Harvey College, Charleston, WV	4 Years	Yes	No

EXPERIENCE

<u>ISOTOPE</u>	<u>MAXIMUM AMOUNT</u>	<u>WHERE EXPERIENCED GAINED</u>	<u>DURATION OF EXPERIENCE</u>	<u>TYPE OF USE</u>
^{137}Cs , ^{226}Ra , ^{60}Co , AmBe , ^{14}C , ^{63}Ni	Curies	Union Carbide Corp.	2 Years	Process Gauging

EDUCATION

BS  - Biology - Morris Harvey College, Charleston, West Virginia

Ms. Allport also participates in instructing a one-week short course in radiation protection for Union Carbide Corporation.

W. K. BECHER

ATTACHMENT 3

<u>TYPE OF TRAINING</u>	<u>WHERE TRAINED</u>	<u>DURATION OF TRAINING</u>	<u>ON THE JOB</u>	<u>FORMAL COURSE</u>
a. Principles and practices of radiation protection	Electric Corp.			
	Westinghouse	4 Years	Yes	Yes
	CGR Medical Corp.	5 Years	Yes	No
	Union Carbide Corp.			
	Training for RPO	40 Hours	Yes	Yes
b. Radioactivity measurement standardization & monitoring techniques & instruments	USAF Keesler AFB	2 Weeks	No	Yes
	Electric Corp.			
	Westinghouse	4 Years	Yes	Yes
	CGR Medical Corp.	5 Years	Yes	No
	Union Carbide Corp.			
c. Mathematics & calculations basic to the use & measurement of radioactivity	Training for RPO	40 Hours	Yes	Yes
	USAF Keesler AFB	2 Weeks	No	Yes
	Electric Corp.			
	Westinghouse	4 Years	Yes	Yes
	CGR Medical Corp.	5 Years	Yes	No
d. Biological effects of radiation	Union Carbide Corp.			
	Training for RPO	40 Hours	Yes	Yes
	USAF Kessler AFB	2 Weeks	No	Yes
	Electric Corp.			
	Westinghouse	4 Years	Yes	Yes

EXPERIENCE

<u>ISOTOPE</u>	<u>MAXIMUM AMOUNT</u>	<u>WHERE EXPERIENCE GAINED</u>	<u>DURATION OF EXPERIENCE</u>	<u>TYPE OF USE</u>
Co ⁶⁰	Curies	Westinghouse Electric	4 Years	Medical
Co ⁶⁰	Curies	CGR Medical Corp.	5 Years	Medical
Cs ¹³⁷	Curies	Union Carbide Corp.	12 Months	Density & Level Gauge
Cs ¹³⁷	m Curies	Union Carbide Corp.	12 Months	Density & Level Gauge
Am ²⁴¹ Be	Neutron	Union Carbide Corp.	12 Months	Carbon Measurement

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<u>TYPE OF TRAINING</u>	<u>WHERE TRAINED</u>	<u>DURATION OF TRAINING</u>	<u>ON THE JOB</u>	<u>FORMAL COURSE</u>
a. Principles and practices of radiation protection	Union Carbide Corp.	8 Years	Yes	No
	Union Carbide Course for Training RPO	40 Hours	Yes	Yes
	Army CBR Training Ft. Eustis	2 Weeks	No	Yes
b. Radioactivity measurement standardization & monitoring techniques & instruments	Union Carbide Corp.	8 Years	Yes	No
	Union Carbide Course for Training RPO	40 Hours	Yes	Yes
	Army CBR Training Ft. Eustis	2 Weeks	No	Yes
c. Mathematics & calculations basic to the use & measurement of radioactivity	Union Carbide Corp.	8 Years	Yes	No
	Union Carbide Course for Training RPO	40 Hours	Yes	Yes
	Army CBR Training Ft. Eustis	2 Weeks	No	Yes
d. Biological effects of radiation	Union Carbide Corp.	8 Years	Yes	No
	Union Carbide Course for Training RPO	40 Hours	Yes	Yes
	Army CBR Training Ft. Eustis	2 Weeks	No	Yes

EXPERIENCE

<u>ISOTOPE</u>	<u>MAXIMUM AMOUNT</u>	<u>WHERE EXPERIENCE GAINED</u>	<u>DURATION OF EXPERIENCE</u>	<u>TYPE OF USE</u>
Cs ¹³⁷	Curies	Union Carbide Corp.	11 Years	Density & Level Gauge, Tracer
Co ⁶⁰	Curies	Union Carbide Corp.	11 Years	Density & Level Gauge
Ra ²²⁶ & daughters	m Curies	Union Carbide Corp.	11 Years	Density & Level Gauge, R&D
C ¹⁴	m Curies	Union Carbide Corp.	6 Years	R&D Tracer
H ³	m Curies	Union Carbide Corp.	6 Years	Tracer
Xe ¹³³	m Curies	Union Carbide Corp.	3 Months	Tracer
Kr ⁷⁹	m Curies	Union Carbide Corp.	3 Months	Tracer
Sr ⁹⁰	m Curies	Union Carbide Corp.	8 Years	R&D
Au ¹⁹⁸	m Curies	Union Carbide Corp.	1 Year	Tracer
I ¹³¹	m Curies	Union Carbide Corp.	3 Months	Tracer
Cs ¹³¹	m Curies	Union Carbide Corp.	3 Months	Tracer
Rb ⁸⁶	m Curies	Union Carbide Corp.	3 Months	Tracer
Am ²⁴¹ Be	Curies	Union Carbide Corp.	3 Years	Carbon Detector

M. E. CAVENDER


ATTACHMENT 3

<u>TYPE OF TRAINING</u>	<u>WHERE TRAINED</u>	<u>DURATION OF TRAINING</u>	<u>ON THE JOB</u>	<u>FORMAL COURSE</u>
a. Principles and practices of radiation protection	Union Carbide Corp.	3 Years	Yes	No
b. Radioactivity measurement standardization & monitoring techniques & instruments	Union Carbide Corp.	3 Years	Yes	No
c. Mathematics & calculations basic to the use & measurement of radioactivity	Union Carbide Corp.	3 Years	Yes	No
	West Virginia State College	35 Credit Hours	No	Yes
d. Biological effects of radiation	Union Carbide Corp.	3 Years	Yes	No

EXPERIENCE

<u>ISOTOPE</u>	<u>MAXIMUM AMOUNT</u>	<u>WHERE EXPERIENCE GAINED</u>	<u>DURATION OF EXPERIENCE</u>	<u>TYPE OF USE</u>
^{137}Cs	Curies	Union Carbide Corp.	5 Years	Density & Level Instruments
^{226}Ra	m Curies	Union Carbide Corp.	5 Years	Density & Level Instruments
H^3	Curies	Union Carbide Corp.	4 Years	R&D
^{14}C	m Curies	Union Carbide Corp.	5 Years	R&D
St^{90}	Curies	Union Carbide Corp.	4 Years	R&D & Density
^{60}Co	Curies	Union Carbide Corp.	4 Years	Density & Level Instruments
Po^{210}Be	Curies	Union Carbide Corp.	3 Years	Carbon Detection
Am^{241}Be	Curies	Union Carbide Corp.	5 Years	Carbon Detection
Ba^{133}	Microcuries	Union Carbide Corp.	5 Years	Counting Standardization
Cd^{109}	Microcuries	Union Carbide Corp.	5 Years	" "
Ci^{36}	Microcuries	Union Carbide Corp.	5 Years	" "
Ni^{36}	Microcuries	Union Carbide Corp.	5 Years	" "

EDUCATION

BS  - Math - West Virginia State College


M. L. GREEN

<u>TYPE OF TRAINING</u>	<u>WHERE TRAINED</u>	<u>DURATION OF TRAINING</u>	<u>ON THE JOB</u>	<u>FORMAL COURSE</u>
a. Principles and practices of radiation protection.	University of Kentucky	9 Months	No	Yes
	University of Kentucky	3 Months	Yes	No
	Mound Lab. (AEC)	39 Months	Yes	No
	Univ. of Cincinnati	8 Months	No	Yes
	Union Carbide Corp.	6 Months	Yes	No
b. Radioactivity measurement standardization & monitoring techniques & instruments	Univ. of Kentucky	9 Months	No	Yes
	Univ. of Kentucky	3 Months	Yes	No
	Mound Lab. (AEC)	39 Months	Yes	No
	Univ. of Cincinnati	8 Months	Yes	No
	Union Carbide Corp.	6 Months	Yes	No
c. Mathematics & calculations basic to the use & measurement of radioactivity	Univ. of Kentucky	9 Months	No	Yes
	Univ. of Cincinnati	8 Months	No	Yes
	Union Carbide Corp.	3 Months	Yes	No
d. Biological effects of radiation	Univ. of Kentucky	5 Days	No	Yes
	Mound Lab. (AEC)	39 Months	Yes	No

EXPERIENCE

<u>ISOTOPE</u>	<u>MAXIMUM AMOUNT</u>	<u>WHERE EXPERIENCE GAINED</u>	<u>DURATION OF EXPERIENCE</u>	<u>TYPE OF USE</u>
U ²³⁸	Kilograms	Univ. of Kentucky	3 Months	Sub-Critical Reactor
Classified Cs ¹³⁷	Classified Curies	Monsanto Research Corp.	39 Months	Classified
Ra ²²⁶	m Curies	Union Carbide Corp.	3 Years	Gauging
Xe ¹³³	m Curies	Union Carbide Corp.	6 Months	Tracer
Cs ¹³⁷	m Curies	Union Carbide Corp.	6 Months	Tracer

EDUCATION

BS  - Physics - University of Kentucky

W. S. KENNEDYATTACHMENT 3

<u>TYPE OF TRAINING</u>	<u>WHERE TRAINED</u>	<u>DURATION OF TRAINING</u>	<u>ON THE JOB</u>	<u>FORMAL COURSE</u>
a. Principles and practices of radiation protection	Union Carbide Corp.	9 Years	Yes	No
	West Virginia Tech	1 Month	No	Yes
	US Air Force	4 Years	Yes	No
b. Radioactivity measurement standardization & monitoring techniques & instruments	Union Carbide Corp.	9 Years	Yes	No
c. Mathematics & calculations basic to the use & measurement of radioactivity	Union Carbide Corp.	9 Years	Yes	No
	West Virginia Tech	3 Months	No	Yes
d. Biological effects of radiation	Union Carbide Corp.	9 Years	Yes	No
	US Air Force	4 Years	Yes	No

EXPERIENCE

<u>ISOTOPE</u>	<u>MAXIMUM AMOUNT</u>	<u>WHERE EXPERIENCE GAINED</u>	<u>DURATION OF EXPERIENCE</u>	<u>TYPE OF USE</u>
Cs ¹³⁷	Curies	Union Carbide Corp.	9 Years	Density & Level Gauge
Ra ²²⁶	m Curies	Union Carbide Corp.	9 Years	Density & Level Gauge
Co ⁶⁰	m Curies	Union Carbide Corp.	9 Years	Density & Level Gauge
C ¹⁴	m Curies	Union Carbide Corp.	9 Years	R&D
H ₃	Curies	Union Carbide Corp.	2 Years	R&D
Sr ⁹⁰	Curies	Union Carbide Corp.	2 Years	Density & Level Gauge
I ¹³¹	Microcuries	Union Carbide Corp.	2 Years	R&D
Po ²¹⁰ Be	Curies	Union Carbide Corp.	1 Year	Carbon Detection
Am ²⁴¹ Be	Curies	Union Carbide Corp.	2 Years	Carbon Detection
Cd ¹⁰⁹	Microcuries	Union Carbide Corp.	2 Years	Counting Standardization
Ba ¹³³	Microcuries	Union Carbide Corp.	2 Years	Counting Standardization
Ci ³⁶		Union Carbide Corp.	2 Years	Counting Standardization

Mr. Kennedy also participates in instructing a one-week short course in radiation protection for Union Carbide Corporation.

C. R. LANDFRIED

ATTACHMENT 3

<u>TYPE OF TRAINING</u>	<u>WHERE TRAINED</u>	<u>DURATION OF TRAINING</u>	<u>ON THE JOB</u>	<u>FORMAL COURSE</u>
a. Principles and practices of radiation protection	Union Carbide Corp.	15 Years	Yes	No
b. Radioactivity measurement standardization & monitoring techniques & instruments	Union Carbide Corp.	15 Years	Yes	No
c. Mathematics & calculations basic to the use & measurement of radioactivity	Union Carbide Corp.	15 Years	Yes	No
d. Biological effects of radiation	Union Carbide Corp.	15 Years	Yes	No

EXPERIENCE

<u>ISOTOPE</u>	<u>MAXIMUM AMOUNT</u>	<u>WHERE EXPERIENCE GAINED</u>	<u>DURATION OF EXPERIENCE</u>	<u>TYPE OF USE</u>
Cs ¹³⁷	Curies	Union Carbide Corp.	18 Years	Density & Level Gauge Tracer
Co ⁶⁰	Curies	Union Carbide Corp.	18 Years	Density & Level Gauge
Ra ²²⁶ & Daughters	m Curies	Union Carbide Corp.	18 Years	Density & Level Gauge, R&D
C ¹⁴	m Curies	Union Carbide Corp.	10 Years	R&D Tracer
H ³	m Curies	Union Carbide Corp.	8 Years	Tracer
Xe ¹³³	m Curies	Union Carbide Corp.	12 Months	Tracer
Kr ⁷⁹	m Curies	Union Carbide Corp.	5 Months	Tracer
Po ²¹⁰ Be	Curies	Union Carbide Corp.	2 Years	Gauging
Sr ⁹⁰	m Curies	Union Carbide Corp.	15 Years	R&D
Am ²⁴¹ Be	Curies	Union Carbide Corp.	3 Years	Gauging

Mr. Landfried also participates in instructing a one-week short course in radiation protection for Union Carbide Corporation.



ROGER V. SEALEY

<u>TYPE OF TRAINING</u>	<u>WHERE TRAINED</u>	<u>DURATION OF TRAINING</u>	<u>ON THE JOB</u>	<u>FORMAL COURSE</u>
a. Principles and practices of radiation protection	Union Carbide Corp. Oak Ridge Associated Universities	8 Years 4 Weeks	Yes No	No Yes
b. Radioactivity measurement standardization & monitoring techniques & instruments	Union Carbide Corp. Wichita State University Oak Ridge Associated Universities	8 Years 1 Year 4 Weeks	Yes No No	No Yes Yes
c. Mathematics & calculations basic to the use & measurement of radioactivity	Union Carbide Corp. Wichita State University Oak Ridge Associated Universities	8 Years 2 Years 4 Weeks	Yes No No	No Yes Yes
d. Biological effects of radiation	Union Carbide Corp. Oak Ridge Associated Universities	1 Year 4 Weeks	Yes No	No Yes

EXPERIENCE

<u>ISOTOPE</u>	<u>MAXIMUM AMOUNT</u>	<u>WHERE EXPERIENCE GAINED</u>	<u>DURATION OF EXPERIENCE</u>	<u>TYPE OF USE</u>
Na ²²	m Curies	Wichita State University	1 Year	R&D
Cs ¹³⁷	m Curies	Wichita State University	1 Year	R&D
C ¹⁴	m Curies	Wichita State University	1 Year	R&D
Sr ⁹⁰	m Curies	Wichita State University	1 Year	R&D
Co ⁶⁰	m Curies	Wichita State University	1 Year	R&D
Bi ²⁰⁷	m Curies	Wichita State University	1 Year	R&D
Ra ²²⁶ & Daughters	m Curies	Wichita State University	1 Year	R&D
C ¹⁴	m Curies	Union Carbide Corporation	11 Years	Tracer
Ra ²²⁶ & Daughters	m Curies	Union Carbide Corporation	8 Years	Density & Level Gauges
Cs ¹³⁷	Curies	Union Carbide Corporation	11 Years	Density & Level Gauges
H ³	Curies	Union Carbide Corporation	4 Years	Tracer
Xe ¹³³	m Curies	Union Carbide Corporation	4 Years	R&D
Cs ¹³¹	m Curies	Union Carbide Corporation	4 Years	R&D
Rb ⁸⁶	m Curies	Union Carbide Corporation	4 Years	R&D
Sn ¹¹³	m Curies	Union Carbide Corporation	5 Years	R&D
Po ²¹⁰	Curies	Union Carbide Corporation	3 Years	R&D
Am ²⁴¹ Be	Curies	Union Carbide Corporation	6 Years	Carbon Detection

EDUCATION

BA  - Math - Wichita State University
 MS  - Physics - Wichita State University

Mr. Sealey also participates in instructing a one-week short course in radiation protection for Union Carbide Corporation.

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F. P. STRACCIA


ATTACHMENT 3

<u>TYPE OF TRAINING</u>	<u>WHERE TRAINED</u>	<u>DURATION OF TRAINING</u>	<u>ON THE JOB</u>	<u>FORMAL COURSE</u>
a. Principles and practices of radiation protection	University of Lowell Lowell, MA	4 Years	No	Yes
	CIS Radiopharmaceuticals Bedford, MA	1.5 Years	Yes	No
	Vermont Yankee Nuclear Power Corp. Vernon, VT	3 Months	Yes	No
b. Radioactivity measurement standardization & monitoring techniques & instruments	University of Lowell Lowell, MA	4 Years	No	Yes
	CIS Radiopharmaceuticals Bedford, MA	1.5 Years	Yes	No
	Vermont Yankee Nuclear Power Corp. Vernon, VT	3 Months	Yes	No
c. Mathematics & calculations basic to the use & measurement of radioactivity	University of Lowell Lowell, MA	4 Years	No	Yes
	CIS Radiopharmaceuticals Bedford, MA	1.5 Years	Yes	No
	Vermont Yankee Nuclear Power Corp. Vernon, VT	3 Months	Yes	No
d. Biological effects of radiation	University of Lowell Lowell, MA	4 Years	No	Yes
	CIS Radiopharmaceuticals Bedford, MA	1.5 Years	Yes	No
	Vermont Yankee Nuclear Power Corp. Vernon, VT	3 Months	Yes	No

EXPERIENCE

<u>ISOTOPE</u>	<u>MAXIMUM AMOUNT</u>	<u>WHERE EXPERIENCE GAINED</u>	<u>DURATION OF EXPERIENCE</u>	<u>TYPE OF USE</u>
^{226}Ra , ^{137}Cs , Mixed Fission Products	m Curies	Univ. of Lowell	3 Years	School Labs
$^{99\text{m}}\text{Tc}$, ^{131}I , ^3H , ^{14}C , ^{99}Mo	Curies	CIS Radiopharmaceuticals	1.5 Years	Preparing Radioisotopes
Mixed Fission Products	Curies	Vermont Yankee	3 Months	Contamination Control HP Monitoring
^{137}Cs , ^{226}Ra , ^{60}Co	Curies	Union Carbide Corp.	11 Months	Process Gauging

EDUCATION

BS  - Radiological Health Physics University of Lowell, Lowell, Massachusetts

Mr. Straccia also participates in instructing a one-week short course in radiation protection for Union Carbide Corporation.

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ATTACHMENT 4

RADIATION DETECTION INSTRUMENTS

Type of Instrument	Number Available	Radiations Detected	Sensitivity Range	Window Thickness (mg/cm ²)	Use
Eberline E-520 (Geiger Counter)	5	β, γ	0-0.2, 2.0, 20, 200, 2000 mr/hr	30.0	Surveying
Texas Nuclear 2592 (Cutie Pie)	2	α, β, γ	0-10, 100,000 mr/hr	1.0	Surveying
Eberline 6112 (Teletector)	2	β, γ	0-2, 50, 2000, 5000, 10,000 mr/hr	30.0	Surveying
Eberline PS-1 (Portable Scaler)	1	α, β, γ	7500 cpm = 1 mr/hr	(Scintillation Type)	Field Measuring
Eberline PRM-5 (Portable Rate Meter)	1	α, β, γ	Dependent on Probe		Field Measuring
Eberline PAC-4G (Low Energy Beta)	1	α, β, γ	500, 5K, 50K, & 500K counts/min	0.85	Surveying
Eberline PNC-4	1	n	0-500,000 counts/min	(BF ₃ tube)	Surveying
Eberline PNR-4	1	n	0-5, 50,000 & 5K millirem/hr	(BF ₃ tube)	Surveying
Dosimeter Corp. Pocket Dosimeters	6	γ, fast n	0-200 mrad	--	Personnel Monitoring
Victoreen 570 (Condenser R-Meter)	2	γ	0-1, 2.5, 5, & 25 Rems	212, 569, 583	Measure field strength for instrument calibration
Single Channel Analyzer (Tennelec, Ortec components)	1	β, γ	Bkgd-100,000 counts/min	1.5	Measuring
Beckman Gas Flow Proportional Counter (Low Beta II)	1	α, β	0.5-5 x 10 ⁴ counts/min	0.5	Measuring
Beckman Liquid Scintillation Counter (LS 9000)	1	α, β, γ	Bkgd-5.6 x 10 ⁶ counts	--	Measuring

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