



UNION CARBIDE CORPORATION
CHEMICALS AND PLASTICS

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

July 23, 1973

U. S. Atomic Energy Commission
Division of Licensing and Regulation
Washington 25, D. C.

Attention Isotopes Branch

Gentlemen:

This is a request for renewal of license 47-260-2. In the several years that this license has been in effect our radioisotope program has continued to grow and we have found it necessary to amend the license twenty-eight times and to submit several explanatory letters in regard to use, leak wipe test procedures, etc. In this renewal application we have submitted a request to add Am-241-Be neutron sources to our list of byproduct material and to expand the range of uses for byproduct material to "research and development" as defined in paragraph 30.4(q) of 10 CFR 30. In the many years that this group and its precursors have worked with byproduct material we have greatly expanded our capabilities and facilities. With this amendment we are seeking the latitude to investigate other potential applications of encapsulated byproduct material of an experimental nature--applications which may not have sufficient general utility to be marketed by current suppliers of nuclear density and level gauges.

To assure that all governmental regulations are followed and that both employee and public safety is assured, the Technical Center has an established, stringently enforced Radiation Protection Program. This program is described in the Technical Center Radiological Control Manual. A copy of this manual is included for your files.

Since we are submitting a complete form with answers either repeated or request for change in the program, we request that this application replace previous letters and documents submitted for the license application and subsequent amendments.

COPIES
SENT TO COMPLIANCE

38567
E-30

RECEIVED

1973 JUL 24 AM 11 41

U.S. ATOMIC ENERGY COMM.
REGULATORY
MAIL SECTION

U. S. Atomic Energy Commission
July 23, 1973
Page 2

We further request that the Development Group of Measurement and Control Technology of Union Carbide Chemicals and Plastics Division continue to be specifically licensed to:

Install and perform initial radiation surveys and leak wipe tests on specific or generally licensed gauges containing byproduct material anywhere in the United States where the Atomic Energy Commission maintains jurisdiction for regulating the use of byproduct material. This condition does not prohibit this activity in agreement states, as defined in Section 30.4(c) of 10 CFR 30 under reciprocity procedures which may be established by those states.

Your early approval of this application would be greatly appreciated. If there are any questions, or if further information is desired, please contact me.

Very truly yours,



Measurement and Control Technology
CHEMICALS AND PLASTICS

RVSealey/ut

Enclosures

RECEIVED

1973 JUL 24 AM 11 41

U. S. ATOMIC ENERGY COMM.
REGULATORY
MAIL SECTION

U. S. ATOMIC ENERGY COMM.

REGULATORY

MAIL SECTION

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: 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.) Union Carbide Corporation P. O. Box 8361 South Charleston, W. Va. 25303 Attention Dr. B. W. DuVall		(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, W. Va. 25303 (See Attachment 1.b)	
2. DEPARTMENT TO USE BYPRODUCT MATERIAL Development Group Measurement & 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 (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.) B. W. DuVall M. E. Cavender C. R. Landfried W. S. Kennedy R. V. Sealey J. A. Boggess 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.) B. W. DuVall, RPO C. R. Landfried, Alternate RPO	
6. (a) BYPRODUCT MATERIAL. (Elements and mass number of each.) A. Cs-137 B. Sr-90 C. Sr-90 D. Co-60 E. Am-241-Be F. Am-241-Be		(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.) Sealed Sources 155 curies total. No source to exceed the rated capacity of its source holder. See attached list of source holders. Sealed Sources 15 curies total Sealed Sources No single source to exceed 20 mCi Sealed Source 1 mCi Sealed Sources Not to exceed 5 curies total Sealed Source 0.1 μ Ci (See attachment for encapsulation and source holders)	
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.) Items A, B, and E are to be used in research and development as defined in 10 CFR 30.4. Item C to be used in chromatography. Items D and F are for calibration purposes.			

30587

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	SEE ATTACHED DATA SHEETS.		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)		

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 Technical Center Radiological Control Manual, Chapter XI					

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

See Technical Center Radiological Control Manual, Chapter VII

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

See Attachment 12.

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 Attachment 13

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 Attachment 14

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.

Date July 23, 1973

By:

Union Carbide Corporation

Applicant named in item 1

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.b

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 USAEC 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 6

Source size will be limited to the maximum activity rating of the source holders.

Encapsulations and source holders we use or expect to use are:

A. Cesium-137

1. U.S. Radium LAB-236, LAB-11C, LAB-11D,
LAB-236CL-4, and LAB-236CL-5

2. Ohmart Corp. A-2102, A-2103, A-2104,
A-2099, A-2095, A-2097

In Ohmart safety holders Models SHRM, SHRH, SHRD,
SHRM-PA, SHRH-A, HM-8, SR-1, SR-2, or Ohmart ASR, LASR,
ES-2, -3, and -4 density gauges.

3. Industrial Nucleonics BB-S-10053, BB-S-10051,
BB-S-10062, BB-S-10063

In Industrial Nucleonics Safety Holders LS-101 or LS-102

4. Nuclear Chicago - RR-138, A/S 850233, 850263, 3M4P6M
TN570-57157C, 3M4P6E

In Nuclear Chicago (Texas Nuclear) source holders
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

B. Strontium 90

1. U.S. Radium Model LAB-207B encapsulation
In Numinco SH-1A source holders

2. Industrial Nucleonics Models BB-0019-3, BBS-10072,
BBS-10073; in Industrial Nucleonics Source Holders
DH-2 or DH-3

C. Strontium 90

1. U.S. Radium Model LAB 369, Chromatographic Cell
2. Barber-Coleman RS 369, Chromatographic Cell
3. U.S. Nuclear C-5, Chromatographic Cell

D. Co⁶⁰

1. Tracerlab R31-1 Hermetically Sealed Source in
a Lead Filled Steel Source Holder

E. Am²⁴¹Be

1. Monsanto Research Corp. Model MRC-N-SS-W-AmBe
10 gallon polyethylene filled steel pot

F. Am²⁴¹Be

1. Monsanto Research Corp. Model MRC-A-SS-W-Am-601
in a cardboard box

SUPPLEMENTAL ATTACHMENT

AEC-313
Item 8

Dr. B. W. DuVall

TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and Practices of radiation protection	Union Carbide Chemicals and Plastics Div.	3 Years	<input checked="" type="radio"/> Yes <input type="radio"/> No	Yes <input type="radio"/> No <input checked="" type="radio"/>
b. Radioactivity measurement standardization & monitoring techniques & instruments	Union Carbide Chemicals and Plastics Div.	3 Years	<input checked="" type="radio"/> Yes <input type="radio"/> No	Yes <input type="radio"/> No <input checked="" type="radio"/>
c. Mathematics & calculations basic to the use & measurement of radioactivity.	Union Carbide Chemicals and Plastics Div.	3 Years	<input checked="" type="radio"/> Yes <input type="radio"/> No	Yes <input type="radio"/> No <input checked="" type="radio"/>
	Wichita State University	9 Months	Yes <input type="radio"/> No <input checked="" type="radio"/>	<input checked="" type="radio"/> Yes <input type="radio"/> No
	U. of Virginia	4 Months	Yes <input type="radio"/> No <input checked="" type="radio"/>	<input checked="" type="radio"/> Yes <input type="radio"/> No
d. Biological effects of radiation	Union Carbide Chemicals and Plastics Div.	3 Years	<input checked="" type="radio"/> Yes <input type="radio"/> No	Yes <input type="radio"/> No <input checked="" type="radio"/>

Educational History

DEGREE	COLLEGE OR UNIVERSITY	DATE ACQUIRED	MAJOR
B.A.	Wichita State University	1962	Physics
M.S.	Wichita State University	1963	Physics
PhD	University of Virginia	1968	Physics

Item 9 - Where Experience Gained

Isotope	Maximum Amt.	Where Experience Gained	Duration of Experience	Type of Use
Po ²¹⁰ Be	Curies	Union Carbide Corp. Chemicals & Plastics Div.	1 Year	Testing steel vessels for carbon buildup
Cs ¹³⁷	Curies	Union Carbide Corp. Chemicals & Plastics Div.	3 Years	Gauging
Am ²⁴¹ Be	Curies	Union Carbide Corp. Chemicals & Plastics Div.	3 Years	Gauging
Ra ²²⁶	mc	Union Carbide Corp. Chemicals & Plastics Div.	3 Years	Research & Development

SUPPLEMENTAL ATTACHMENT

Item 8

C. R. Landfried

TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB		FORMAL COURSE	
a. Principles and practices of radiation protection	Union Carbide Olefins Division	15 years	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No
b. Radioactivity measurement standardization and monitoring techniques and instruments	Union Carbide Olefins Division	15 years	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No
c. Mathematics & calculations basic to the use & measurement of radioactivity.	Union Carbide Olefins Division	15 years	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No
d. Biological effects of radiation	Union Carbide Olefins Division	15 years	<input checked="" type="radio"/> Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No

SUPPLEMENTAL ATTACHMENT

Item 9

C. R. Landfried

Isotope	Maximum Amount	Where experience gained	Duration of Experience	Type of Use
Cs ¹³⁷	Curies	Union Carbide Corp.	15 years	Density & Level Gauge Tracer
Co ⁶⁰	Curies	Union Carbide Corp.	15 years	Density & Level Gauge
Ra ²²⁶ & daughters	mc	Union Carbide Corp.	15 years	Density & Level Gauge R&D
C ¹⁴	mc	Union Carbide Corp.	7 years	R&D Tracer
H ³	mc	Union Carbide Corp.	5 years	Tracer
Xe ¹³³	mc	Union Carbide Corp.	9 months	Tracer
Kr ⁷⁹	mc	Union Carbide Corp.	2 months	Tracer
Po ²¹⁰ Be	Curies	Union Carbide Corp.	1 year	Gauging
Sr ⁹⁰	mc	Union Carbide Corp.	15 years	R&D
Am ²⁴¹ Be	curies	Union Carbide Corp.	3 years	Gauging

Mr. Landfried has also taught formal courses for Union Carbide Corporation concerning the material listed in Items 8a, 8b, and 8c.

23567

TRAINING AND EXPERIENCE

Type of Training	Where Trained	Duration of Training	
a) Principles of practices of radiation protection	Union Carbide Corporation Oak Ridge Associated Universities	8 years 4 weeks	On the job Formal Course
b) Radioactivity measurement, standardization & monitoring techniques and instruments	Union Carbide Corporation Wichita State University Oak Ridge Associated Universities	8 years 1 year 4 weeks	On the job Formal Course Formal Course
c) Mathematics and calculations basic to the use and measurement of radioactivity	Union Carbide Corporation Wichita State University Oak Ridge Associated Universities	8 years 2 years 4 weeks	On the job Formal Course Formal Course
d) Biological Effects of Radiation	Union Carbide Corporation Oak Ridge Associated Universities	1 year 4 weeks	On the job Formal Course

Item 9

Experience with Radiation

Isotope	Maximum Amount	Where Experience Gained	Duration of Experience	Type of Use
Na ²²	mc	Wichita State University	1 year	R & D
Cs 137	mc	Wichita State University	1 year	R & D
Cl ¹⁴	mc	Wichita State University	1 year	R & D
Sr ⁹⁰	mc	Wichita State University	1 year	R & D
Co ⁶⁰	mc	Wichita State University	1 year	R & D
Bi ²⁰⁷	mc	Wichita State University	1 year	R & D
Ra ²²⁶ & daughters	mc	Wichita State University	1 year	R & D
Cl ¹⁴	mc	Union Carbide Corporation	8 years	Tracer
Ra ²²⁶ & daughters	mc	Union Carbide Corporation	5 years	Density & Level Gauges
Cs ¹³⁷	curies	Union Carbide Corporation	8 years	Density & Level Gauges
H ³	curies	Union Carbide Corporation	13 months	Tracer
Xe 133	mc	Union Carbide Corporation	1 year	R & D
Cs 131	mc	Union Carbide Corporation	1 year	R & D
Rb 86	mc	Union Carbide Corporation	1 year	R & D
Sn 113	mc	Union Carbide Corporation	2 years	R & D
Po 210	curies	Union Carbide Corporation	21 days	R & D
Am ²⁴¹ Be	curies	Union Carbide Corporation	3 years	Carbon Detection

SUPPLEMENTAL ATTACHMENT

Item 8

M. L. Green

TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB		FORMAL COURSE	
a. Principles and practices of radiation protection	University of Ky.	9 months	Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No
	University of Ky.	3 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No
	Mound Lab. (AEC)	39 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No
	University of Cin.	8 months	Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No
	Union Carbide Corp.	36 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No
b. Radioactivity measurement standardization & monitoring techniques & instruments	Univ. of Kentucky	9 months	Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No
	Univ. of Kentucky	3 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No
	Mound Lab. (AEC)	39 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No
	Univ. of Cincinnati	8 months	Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No
	Union Carbide Corp.	36 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No
c. Mathematics & calculations basic to the use & measurement of radioactivity	Battelle Columbus Labs	24 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No
	Univ. of Kentucky	9 months	Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No
	Univ. of Cincinnati	8 months	Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No
	Union Carbide Corp.	36 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No
d. Biological effects of radiation	Battelle Columbus Labs	24 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No
	Univ. of Kentucky	5 days	Yes	<input type="radio"/> No	<input checked="" type="radio"/> Yes	<input type="radio"/> No
	Mound Lab (AEC)	39 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No
	Union Carbide Corp.	2 months	<input checked="" type="radio"/> Yes	<input type="radio"/> No	Yes	<input type="radio"/> No

SUPPLEMENTAL ATTACHMENT

Item 9

M. L. Green

Isotope	Maximum Amount	Where Experience Gained	Duration of Experience	Type of Use
U^{238}	kilograms	University of Kentucky	3 months	Sub-Critical Reactor
Classified	classified	Monsanto Research Corp.	39 months	Classified
Cs^{137}	curies	Union Carbide Corp.	36 months	Gauging
Ra^{226}	mc	Union Carbide Corp.	34 months	Gauging
Xe^{133}	mc	Union Carbide Corp.	34 months	Tracer
Cs^{137}	mc	Union Carbide Corp.	34 months	Tracer
$Am^{241}Be$	curies	Union Carbide Corp.	2 months	Carbon Detection

SUPPLEMENTAL ATTACHMENT

Item 8

M. E. Cavender

TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB		FORMAL COURSE	
a. Principles and practices of radiation protection	Union Carbide Chemicals & Plastics Div.	3 years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
b. Radioactivity measurement standardization & monitoring techniques & instruments	Union Carbide Chemicals & Plastics Div.	3 years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
c. Mathematics & calculations basic to the use & measurement of radioactivity	Union Carbide Chemicals & Plastics Div.	3 years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
	W. Va. State College	35 credit hours	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
d. Biological effects of radiation	Union Carbide Chemicals & Plastics	3 years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

SUPPLEMENTAL ATTACHMENT

Item 9

M. E. Cavender

Isotope	Maximum Amount	Where experience gained	Duration of Experience	Type of Use
Cs ¹³⁷	Curies	Union Carbide Corp.	3 years	Density & Level Instruments
Ra ²²⁶	mc	Union Carbide Corp.	3 years	Density & Level Instruments
H ³	Curies	Union Carbide Corp.	2 years	R & D
C ¹⁴	mc	Union Carbide Corp.	3 years	R & D
Sr ⁹⁰	Curies	Union Carbide Corp.	2 years	R & D and Density
Co ⁶⁰	Curies	Union Carbide Corp.	2 years	Density & Level Instruments
Po ²¹⁰ Be	Curies	Union Carbide Corp.	1 year	Carbon Detection
Am ²⁴¹ Be	Curies	Union Carbide Corp.	2 years	Carbon Detection
Ba ¹³³	µc	Union Carbide Corp.	2 years	Counting Standardization
Cd ¹⁰⁹	µc	Union Carbide Corp.	2 years	" "
Cl ³⁶	µc	Union Carbide Corp.	2 years	" "
Ni ⁶³	µc	Union Carbide Corp.	2 years	" "

SUPPLEMENTAL ATTACHMENT

Item 8

W. S. Kennedy

TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB		FORMAL COURSE	
			<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
a. Principles and practices of radiation protection	Union Carbide Chemicals & Plastics Div.	4 years	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
	W.Va. Tech	1 mo.	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
	U.S. Air Force	4 years	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
b. Radioactivity measurement standardization & monitoring techniques & instruments	Union Carbide Chemicals & Plastics	4 years	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
c. Mathematics & calculations basic to the use & measurement of radioactivity	Union Carbide Chemicals & Plastics Div.	4 years	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
	W. Va. Tech	3 mo.	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
d. Biological effects of radiation	Union Carbide Chemicals & Plastics Div.	4 years	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
	U.S. Air Force	4 years	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>

SUPPLEMENTAL ATTACHMENT

Item 9

W. S. Kennedy

Isotope	Maximum Amount	Where experience gained	Duration of Experience	Type of Use
Cs ¹³⁷	Curies	Union Carbide Corp.	4 years	Density & Level Gauge
Ra ²²⁶	mc	Union Carbide Corp.	4 years	Density & Level Gauge
Co ⁶⁰	mc	Union Carbide Corp.	4 years	Density & Level Gauge
C ¹⁴	mc	Union Carbide Corp.	4 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	μc	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	μc	Union Carbide Corp.	2 years	Counting Standardiza- tion
Ba ¹³³	μc	Union Carbide Corp.	2 years	Counting Standardiza- tion
Cl ³⁶	μc	Union Carbide Corp.	2 years	Counting Standardiza- tion

SUPPLEMENTAL ATTACHMENT

Item 8

J. A. Boggess

TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB	FORMAL COURSE
a. Principles and practices of radiation protection	Union Carbide Corp.	8 years	<input checked="" type="radio"/> Yes <input type="radio"/> No	Yes <input type="radio"/> No
	Union Carbide Course For Training RPO	40 hours	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
	Army CBR Training Ft. Eustis	2 weeks	Yes <input checked="" type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
b. Radioactivity measurement standardization & monitoring techniques & instruments	Union Carbide Corp.	8 years	<input checked="" type="radio"/> Yes <input type="radio"/> No	Yes <input type="radio"/> No
	Union Carbide Course For Training RPO	40 hours	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
	Army CBR Training Ft. Eustis	2 weeks	Yes <input checked="" type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
c. Mathematics & calculations basic to the use & measurement of radioactivity	Union Carbide Corp.	8 years	<input checked="" type="radio"/> Yes <input type="radio"/> No	Yes <input type="radio"/> No
	Union Carbide Course For Training RPO	40 hours	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
	Army CBR Training Ft. Eustis	2 weeks	Yes <input checked="" type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
d. Biological effects of radiation	Union Carbide Corp.	8 years	<input checked="" type="radio"/> Yes <input type="radio"/> No	Yes <input type="radio"/> No
	Union Carbide Course For Training RPO	40 hours	<input checked="" type="radio"/> Yes <input type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No
	Army CBR Training Ft. Eustis	2 weeks	Yes <input checked="" type="radio"/> No	<input checked="" type="radio"/> Yes <input type="radio"/> No

SUPPLEMENTAL ATTACHMENT

Item 9

J. A. Boggess

Isotope	Maximum Amount	Where Experience Gained	Duration of Experience	Type of Use
Cs ¹³⁷	curies	Union Carbide Corp.	8 years	Density & Level Gauge, Tracer
Co ⁶⁰	curies	Union Carbide Corp.	8 years	Density & Level Gauge
Ra ²²⁶ & daughters	mc	Union Carbide Corp.	8 years	Density & Level Gauge R&D
C ¹⁴	mc	Union Carbide Corp.	3 years	R&D Tracer
H ³	mc	Union Carbide Corp.	3 years	Tracer
Xe ¹³³	mc	Union Carbide Corp.	3 months	Tracer
Kr ⁷⁹	mc	Union Carbide Corp.	3 months	Tracer
Sr ⁹⁰	mc	Union Carbide Corp.	8 years	R&D
Au ¹⁹⁸	mc	Union Carbide Corp.	1 year	Tracer
I ¹³¹	mc	Union Carbide Corp.	3 months	Tracer
Cs ¹³¹	mc	Union Carbide Corp.	3 months	Tracer
Rb ⁸⁶	mc	Union Carbide Corp.	3 months	Tracer
Am ²⁴¹ Be	curies	Union Carbide Corp.	6 months	Carbon Detection

Attachment 12

Personnel who are assigned to work routinely with radioactive materials are issued film badges supplied by R. S. Landauer Jr & Company. These badges are returned semi-monthly for evaluation and a report is received from R. S. Landauer Jr & Company showing the results for each badge and the accumulative exposure.

There are no routine bio-assay procedures in use but facilities are available should such services be required.

Attachment 13

A brief description of the Radiation Physics Laboratory is included in the Technical Center Radiological Control Manual. Remote handling tools consist primarily of long handled forceps. Shielding consists of various combinations of lead, steel, concrete, and polyethylene assembled as needed.

Attachment 14 Radiation Protection Program*

- A. All requisitions for radioactive sources must be approved by the Technical Center Radiation Protection Officer.
- B. All incoming sources are checked by the Radiation Protection Officer or an approved user (Item 4).
 - 1. The carton is surveyed with a survey meter before opening.
 - 2. The source is surveyed and a leak-wipe test is made even though a leak-wipe certificate accompanies the source.
 - 3. The packing material is checked for radiation contamination.
- C. When the source is mounted, the area within one foot distance is surveyed.
 - 1. Shielding is installed to limit the exposure level below 5 mr/hr with the source in the "On" position...where it is possible for personnel to get into the field of radiation.
 - 2. Radioactive material signs are placed in conspicuous places to notify personnel about the source.
 - 3. Leak-wipe tests are made as required; every 6 months or within 3 years depending on the type holder. Sources are also leak-wipe tested after being moved from one location to another.
- D. All work with the sources is performed by one of the listed users or by personnel under their direct supervision.
- E. Leak-Wipe Test

With the shutter closed, all seams of the source housing are wiped with a Q-Tip moistened with 10% Radiacwash solution or other appropriate solvent. The Q-Tip is analyzed for contamination in either the Beckman Low Beta II or one of the other two counting systems in the Radiation Physics Laboratory. The leak wipe counting procedure is described in the attached manual.

*The program is more fully detailed in the attached Technical Center Radiological Control Manual.