

HEADQUARTERS
DEPARTMENT OF THE ARMY
Office of the Deputy Chief of Staff for Logistics
Washington, D. C. 20310

DALC-MAS-I

1 August 1973

US Atomic Energy Commission
Directorate of Licensing
Materials Branch
Washington, D.C. 20545

Gentlemen:

Forwarded for your consideration is an application for a NEARC
Byproduct Material License for issue to the US Army Electronics
Command, Fort Monmouth, New Jersey.

A license is needed to authorize Fort Monmouth to possess some
70 curies sealed sources of Krypton 85, each source being less than
7 millicuries.

This material is currently authorized to Edgewood Arsenal under
license No. 19-01826-02. The logistics responsibility for the item
for which the material is used will be transferred to the US Army
Electronics Command.

Sincerely yours,

S. Strauss
PETER M. BALDIHO
Chief, Support Division

1 Incl
As Stated

Copies furnished:

DASG-HCH w incl 1 (2 cys)
AMCSF-P wo incl 1

Information in this record was deleted
in accordance with the Freedom of Information
Act, exemptions 6
FOIA-2008-0238

II/5

48187

Info by AMCSF-P wo incl 1 DALC-MAS-I Mr Fegan/jg/l Aug 73

AMCSP-2 (27 Apr 73) 1st Ind
SUBJECT: Application for AEC License

Headquarters, US Army Materiel Command, 5001 Eisenhower Ave., Alexandria,
VA 22304 17 July 1973

TO: HQDA (DALO-MAS-1) WASH DC 20310

1. This headquarters has reviewed the US Army Electronics Command's application for an AEC Byproduct Material License and recommends approval.

2. This application requests a transfer of logistic responsibility for Krypton-85 sources from Edgewood Arsenal which holds a current AEC License EML 19-01826-02 to US Army Electronics Command.

FOR THE COMMANDER:

1 Incl
nc

DARWIN M. TARAS
Chief, Health Physics
Safety Office

Cy Furr:
Director, US Army Materiel Command Field Safety Agency, Charlestown, IN 47111

T.B. Grucci *T.B. Grucci*
48864/df

AMCEL-57

27 April 1973

SUBJECT: Application for AEC License

Commander
US Army Material Command
ATTN: AMCEL-P
5001 Eisenhower Avenue
Alexandria, VA 22304

In accordance with AMCR 385-9, application for AEC license is forwarded.

FOR THE COMMANDER

1 Incl (3 cys)
ms

REINHOLD M. SAVARIS
Chief
Safety Office

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.

10362

03212 CRB

01022

1. (a) NAME AND STREET ADDRESS OF APPLICANT. (Institution, firm, hospital, person, etc. Include ZIP Code.)
U.S. Government Dept of the Army
US Army Electronics Command
ATTN: AMSEL-SF
Fort Monmouth, NJ 07703

(b) STREET ADDRESS(ES) AT WHICH BYPRODUCT MATERIAL WILL BE USED. (If different from 1(a). Include ZIP Code.)
Will be possessed and used worldwide by
US Army Military and civilian personnel
See Supplement 6

2. DEPARTMENT TO USE BYPRODUCT MATERIAL
Department of the Army activities and units worldwide

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

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.)
Individual employees of the US Army, military and civilian, further described in items 8 and 9.

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.)
Stanley B. Potter
James M. Garner, Jr. (alternate)
See Supplement 1

6. (a) BYPRODUCT MATERIAL. (Elements and mass number of each.)
Krypton - 85

(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.)
No more than 70,000 millicuries of Krypton - 85 contained in sealed sources, each source containing less than 7 millicuries of Krypton - 85. The source is constructed as prescribed in MIL-R-51305(MU), the military specification which is enclosed in Supplement 2. This commodity is presently licensed by US Army, Edgewood Arsenal, Md, license No. 19-01826-02.

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.)
These sources are used to check the functional operation of the radiac instrument that is part of the radiac set AN/FDR-27(). The sources are a part of the radiac set AN/FDR-27() and are used by holding the source in the proximity of the probe thus causing the instrument to register the presence of radiation. In addition there will be receiving, unpackaging, inspection, testing, packaging, storing and shipping of the AN/FDR-27(). The radioactive sources will not be repaired or altered, as indicated in TM 3-6665-264-10, a draft of which is enclosed in Supplement 3.

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

TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
Principles and practices of radiation protection	See Supplement 4		Yes No	Yes No
Radioactivity measurement standardization and monitoring techniques and instruments			Yes No	Yes No
Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
Biological effects of radiation			Yes No	Yes No

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

SOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
		See paragraph 8 above		

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)
Radiometer AN/PDR-27()	1 per test sample	Beta-Gamma	0-0.5 0-5 0-50 0-500	3 to 4	Monitoring Surveying

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

See Supplement 8

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

None required

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

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 supplement 5

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. Disposed of in accordance with Section V, TM 3-6665-264-10, Supplement 3

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.

Department of the Army
US Army Electronics Command

Applicant named in item 1

Date: 27 APR 1973

By: *Bernard M. Savaiko*

BERNARD M. SAVAIKO
Chief, Safety Office

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.

INDEX OF SUPPLEMENTS

- Supplement 1. Training and Experience of Radiological Protection Officer and Alternate.
- Supplement 2. Military specification MIL-R-51305 (MU).
- Supplement 3. TM 3-6665-264-10 (Draft), the Operator's Manual for Radioactive Test Sample: Krypton 85, Gamma; MX 7338/PDR-27R.
- Supplement 4. Training and Experience of individual users.
- Supplement 5. Radiation protection program.
- Supplement 6. Locations where Radioactive Test Sample will be used.
- Supplement 7. USAMUCOM DMWR 3-6665-264.
- Supplement 8. Calibration of instruments.

SUPPLEMENT 1

Training and Experience of Radiological Protection Officer and
Alternate.

Resume of Training and Experience
of Stanley B. Potter

1. Educational background:

Colorado State University	4 yrs	[]	BS, Physics
Chemical Corps School	2 wks	1964	Compl Radiation Safety Course
Naval Postgraduate School	2 yrs	1969	Compl Nuclear (Effects) Engineering Curriculum
Nuclear Weapons School	8 wks	1969	Compl SONAC, NET OPS, NHFC

2. Vocational experience with radiation:

1961-1964 At Nuclear Defense Laboratory, Edgewood Arsenal, Md, as research physicist.

1964-1967 With US Army in Germany, as Radiation Protection Officer for the 32d Army Air Defense Command.

1969-1972 With Defense Nuclear Agency in Albuquerque, New Mexico, as Chief, Radiation Safety Support Division, Nuclear Weapons School.

1972 With Pan American Airways, Environmental Health contractor for NASA and the Air Force at Cape Kennedy, Florida, as Chief, Health Physics Division.

1972 With US Army Electronics Command, Fort Monmouth, NJ as Chief, Health Physics Division.

3. Formal Training in Radiation:

a. Principles and practices of radiation protection.

<u>Where Trained</u>	<u>Duration of Training</u>
Colorado State University	24 weeks
Chemical Corps School	2 weeks
Naval Postgraduate School	2 years
Nuclear Weapons School	8 weeks

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b. Radioactivity measurement, standardization, and monitoring techniques and instruments.

<u>Where Trained</u>	<u>Duration of Training</u>
Colorado State University	12 weeks
Chemical Corps School	2 weeks
Naval Postgraduate School	36 weeks
Nuclear Weapons School	8 weeks

c. Mathematics and calculations basic to the use and measurement of radioactivity.

<u>Where Trained</u>	<u>Duration of Training</u>
Colorado State University	24 weeks
Chemical Corps School	2 weeks
Naval Postgraduate School	2 years
Nuclear Weapons School	8 weeks

d. Biological effects of radiation.

<u>Where Trained</u>	<u>Duration of Training</u>
Chemical Corps School	2 weeks
Naval Postgraduate School	36 weeks
Nuclear Weapons School	2 weeks

4. On-the-job training in radiation.

a. Principles and practices of radiation protection.

<u>Where Trained</u>	<u>Duration of Training</u>
Nuclear Defense Laboratory	3 yrs - 1961-1964
Germany	3 yrs - 1964-1967
Albuquerque, New Mexico	3 yrs - 1969-1972
Cape Kennedy, Florida	1 mo - 1972
Fort Monmouth, New Jersey	4 mo - 1972

b. Radioactivity measurement, standardization, and monitoring techniques and instruments.

<u>Where Trained</u>	<u>Duration of Training</u>
Nuclear Defense Laboratory	3 yrs - 1961-1964
Germany	3 yrs - 1964-1967
Albuquerque, New Mexico	3 yrs - 1969-1972
Cape Kennedy, Florida	1 mo - 1972
Fort Monmouth, New Jersey	4 mo - 1972

c. Mathematics and calculations basic to the use and measurement of radioactivity.

<u>Where Trained</u>	<u>Duration of Training</u>
Nuclear Defense Laboratory Germany	3 yrs - 1961-1964
Albuquerque, New Mexico	3 yrs - 1964-1967
Cape Kennedy, Florida	3 yrs - 1969-1972
Fort Monmouth, New Jersey	1 mo - 1972
	4 mo - 1972

5. Experience with radioisotopes.

<u>Isotope</u>	<u>Maximum Activity</u>	<u>Place of Experience</u>	<u>Duration of Experience</u>
Ra ²²⁶	Less than 10 curies	Colorado State University	3 mo
Co ⁶⁰	Kilocuries	Naval Postgraduate School	3 mo
		Colorado State University	3 mo
		Chemical Corp School	6 mo
		Naval Postgraduate School	3 mo
Am ²⁴¹	Millicuries	Albuquerque, New Mexico	3 yrs
		Albuquerque, New Mexico	3 yrs
Pr ¹⁴⁷	Hundreds of curies	Cape Kennedy, Florida	1 mo
Pu ²³⁸	Kilocuries	Albuquerque, New Mexico	3 yrs
		Cape Kennedy, Florida	1 mo
Pu ²³⁹	Curies	Albuquerque, New Mexico	3 yrs
Co ⁵⁷	Millicuries	Albuquerque, New Mexico	1 yr
Th ²³²	Kilocuries	Albuquerque, New Mexico	3 yrs
Th ²²⁹	Curies	Edgewood, Maryland	3 yrs
Tritium	Hundreds of curies	Edgewood, Maryland	3 yrs
		Albuquerque, New Mexico	3 yrs
I ¹³¹	Millicuries	Edgewood, Maryland	1 yr
		Naval Postgraduate School	1 yr
Po Be	Curies	Edgewood, Maryland	3 yrs
Pu Be	Curies	Edgewood, Maryland	3 yrs
Ir ¹⁹²	Hundreds of curies	Cape Kennedy, Florida	1 mo
Kr ⁸⁵	Hundreds of curies	Cape Kennedy, Florida	1 mo
U ²³⁸	Millicuries	Albuquerque, New Mexico	3 yrs
Sr ⁹⁰	Millicuries	Germany	3 yrs
		Albuquerque, New Mexico	3 yrs
		Colorado State University	3 mo
Y ⁹⁰	Millicuries	Germany	3 yrs
		Albuquerque, New Mexico	3 yrs
		Colorado State University	3 mo

6. Experience with devices equivalent to that of actual use of radioisotopes.

<u>DEVICE</u>	<u>PLACE OF EXPERIENCE</u>	<u>DURATION</u>
Cockroft Walton Accelerator	Edgewood, Maryland	2 years
Betatron	Edgewood, Maryland	1 year
Van de Graaff Accelerator	Naval Postgraduate School	1 year

PERSONAL RESUME OF J. M. GARNER, JR.

September, 1970

PERSONAL

Name: James Monroe Garner, Jr.
Address: U. S. Army Electronics Command, ATTN: AMSEL-SF, Ft. Monmouth, NJ 07703
Telephone: 201-532-3493
Birthdate: [REDACTED]
Birthplace: [REDACTED]
Marital: [REDACTED]
Interest: Health Physicist, Radiological Physics & Radiation Engineering

EDUCATION

High School: Marfa High School, Marfa, Texas []
College: Sul Ross State Teachers College, Alpine, Texas (1934-35)
Baylor University, Waco, Texas (1935-38)
College of Marshall, Marshall, Texas (1938-39)
Daniel Baker College, Brownwood, Texas (1939-40)
B.S. Degree (Science & Education) Total Semester Hours 153 1/3
Post Graduate: University of Delaware, Newark, Delaware (1945-47)
Courses in Electronics, Atomic and Nuclear Physics.
Other: Special Health Physics Training:
Health Physics, Oak Ridge National Laboratory (1949)
Radiation Safety and Control, ORNL (1960-61)
Field Training in Applied Health Physics, ORNL (1961)
AEC Orientation Course on Licensing and Regulations,
Bethesda, Maryland (1964)
Safe Handling of Radioisotopes in Industry, sponsored by the
Oak Ridge Society for Nondestructive Testing, (4 weeks course) 1964
Health Physics Training Course (11 weeks) sponsored by the
East Tennessee Chapter of the Health Physics Society, Spring
and Summer 1964
Several short courses and training conferences sponsored by
Health Physics Societies, U.S. Public Health Service, etc.

Lectured and have attended lectures given by other staff members
of Oak Ridge Institute of Nuclear Studies as follows: Basic
Research Course (8 weeks), Medical Qualification (3 weeks),
Health Physics (10 weeks), Advanced Health Physics (3 weeks),
Activation Analysis (2 weeks), Radioisotope Application to
Highway Engineering (3 weeks)

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J. H. Garner, Jr.

PROFESSIONAL ORGANIZATIONS

Member: Radiological Health Section of the American Public Health Association, International Radiation Protection Association
Charter Member: Health Physics Society, Alabama Chapter Health Physics Society, University Radiation Safety Officers - National, Southeastern Section - University Radiation Safety Officers
Former Member: East Tennessee Health Physics Society, Tennessee Academy of Science, Southeastern Section American Physical Society, American Institute of Physics, Balto-Wash Health Physics Society, Deep South Chapter Health Physics Society (Charter), American Physical Society (Charter), Conference on Radiological Health

PUBLICATIONS

"Neutron Effect on Animals:", by the Staff of the Biochemical Research Foundation. The Williams & Wilkins Co., Baltimore, Md. Chapter 3 -- Fast Neutron Irradiation Procedure; Chapter 5 -- A Study of Possible Reactions of Microorganisms to Sublethal Bombardment with Neutrons; Chapter 7 -- Effects of Neutrons on Early Root Development of Zea Mays.

"Electrical Impulse Counter", by James M. Garner, Jr. and June Peterson Oakley, Journal of the Franklin Institute, Vol. 247 No. 2, February, 1949

"Rust and Phosphorus Distribution in Wheat Leaves", David Gottlieb and James M. Garner, Jr., Phytopathology 36, 557-64 (1946)

"Obligate Parasitism", James M. Garner, Jr. and David Gottlieb, Nature, Vol. 157, No. 3986, March, 1946

"System Continuously Records Water Level and Contamination", by James M. Garner, Jr. and Ford Kalil, Nucleonics, Vol. 14, No. 7, 56-60, July, 1956

"Radioactive Sediments in Tennessee River System", James M. Garner, Jr. and O. W. Kotchtitzky, Journal Sanitary Engineering Division, August, 1956

Internal reports at the various places of employment

PUBLIC SPEAKING

Papers presented at Society Meetings:

"A Proposed Emergency Evacuation Radioactivity Monitoring System", 1958.

"Radiation Monitoring Utilizing Average Current from Halogen-Quenched G M Tubes, 1959.

Evaluation of Commercial Film Badge Suppliers, 1969

Auburn University Radiological Health Program, 1969

Film Badge Testing Program, 1970

EXPERIENCE:

-3-

Dates: March 1971 to present
Company: US Army Electronics Command, Fort Monmouth, New Jersey
Title: ECOM Health Physicist
Duties: Supervise Radiation Protection Programs for items of supply developed and managed by US Army Electronics Command

Dates: August 1966 to 1971
Company: Auburn University, Auburn, Alabama
Title: Radiological Safety Officer, Head of the Office of Radiological Safety and Secretary of the University Radiological Safety Committee
Duties: Serve as Radiological Safety Officer, keep records of the proceedings of the Radiological Safety Committee and supervise the work of Radiological Safety Technicians and clerical staff. Evaluate radiation surveys, consult with and advise users of radionuclides and radiation producing devices. Inspect and rate laboratories and equipment regarding suitability for use for various quantities and types of radionuclides, and radiation producing devices. Approve or disapprove facilities and/or users for the use of radionuclides and radiation devices. Prepare applications for licenses and see to it that the University meets the requirements of such licenses. Write rules, regulations and recommendations, and reports regarding the use of radionuclides and radiation producing devices.

Dates: 1964 - 1966
Company: American Nuclear Corp., Box 426, Oak Ridge, Tennessee
Title: Radiological Engineer, Health Physicist, and Radiation Safety Officer
Duties: Make and evaluate radiation surveys, keep records required for Isotopes licenses, radioactive waste disposal, recommend ways of improving radiation safety, design source arrays and shielding for irradiators, supervise "Hot Cell Building" work, serve on Isotope Committee.

Dates: 1963 - 1964
Company: Oak Ridge Institute of Nuclear Studies, Special Training Division, Oak Ridge, Tennessee
Title: Senior Scientist
Duties: Lectured in Health Physics in various courses given by ORINS. Responsible for Applied Health Physics in above division. Helped organize a new course in Applied Health Physics.

Dates: 1961 - 1963
Company: Army Nuclear Power Field Office, Operation Support Department, Ft. Belvoir, Virginia
Title: Health Physicist
Duties: (From May 24, 1962 to August 16, 1963) - Acting Chief, Radiological Branch & NPFO Health Physicist - Member of the USAEC and FB Isotope and Radiological Committee, acting as NPFO contact effecting policy coordination among NPFO organizations and USAEC and FB agencies. Acted on behalf of the Committee's RSO on matters relating solely

J. M. Garner, Jr.

to NPFO, such as internal (NPFO) use, storage, movement and shipment of licensed by-product materials. Maintained records of radioactive sources. Spot checks made to insure proper compliance. Also duties listed below.

(From December 21, 1961 to May 24, 1962) - Acting Chief, Radiological Branch, OSD/NPFO. Planned, directed and supervised the health physics, radiochemistry and waste control support programs for all military land and barge nuclear power reactors, embracing reviews of operations, plant design and modifications, inspection of facilities, analysing operating problems and radiological hazards. Responsible for radiological safety instrumentation, process and effluent monitors, source shielding criteria, formation of policy, standards and procedures.

(From July 10, 1961 to December 21, 1961) - Consultant to NPFO on radiological safety, operation, plant designs, inspection and health physics studies on operating problems and hazards, wrote instrument specifications and procedures. Advised on health physics regulations. Monitored field plants.

Dates: 1949 to 1961

Company: Oak Ridge National Laboratory, Oak Ridge, Tennessee

Titles: Health Physicist from July 1954 to June 1961, Associate Health Physicist from February 1949 to July 1954. Part of this time in H.P. Research and Development and part in Applied Health Physics. Main H. P. Sections or Groups: Applied Assay - Instruments Group, Applied Radiobiology Section, Technology Section, Electronic Instrument Group, Waste Disposal Section.

Duties: Supervised the work of from 0 to 4 persons, worked independently or as member of team -- depending on project. Planned, developed procedures for, conducted studies and investigations of radiological health hazards in biological, chemical and physical laboratories, pilot plants, reactors and weapons tests, waste streams, rivers and lakes, and humans. Investigated radiological incidents. Developed instrumentation for detection measurement and/or monitoring radiation in air, ground waters, waste streams, water and bottom deposits of rivers and lakes, fish, and on ground surface from an airplane, in human beings, animals, and low level biological and environment samples. Lectured and gave demonstration tours. Served as the Health Physics Division's representative on the Instrumentation and Controls Division's Instrument and Electronic Parts Committee, and as a consultant to the Waste Disposal Research Section, TVA Ecological Committee, the USGS and on the NS Savannah.

J. M. Gerner, Jr.

Dates: 1942 - 1949
Company: Biochemical Research Foundation, Newark, Delaware
Title: Physicist
Duties: (From March 1948 to February 1949) - Head of Cyclotron Department. Responsible for operation, development, calibration and maintenance of the cyclotron, X-ray equipment, radioactive sample counting laboratory and radiation health surveys. Reviewed plans and specifications for laboratories using ionizing radiation and advised on designs of protective devices. Collaborated with other departments on use of radioisotopes, X-rays and neutrons in plant and animal research.

(From November 1942 to March 1948) - (Physicist) Conducted studies of radioactivity in medical treatment, adapted instrumentation for measurements. Re-designed and constructed a new dee oscillator and filament oscillator for the cyclotron. Worked with the University of Delaware on problems involving radioisotopes, X-rays and neutrons. Worked on contract for Manhattan District, Army Service Forces - Corp of Engineers in work essential to the production of the Atomic Bomb.

REFERENCES: Dr. Reginald I. Vachon
218 Ross Hall
Auburn University
Auburn, Alabama 36830 Phone: 205-826-4574

Mr. Encel H. Dodge, Director
Contract & Grant Development
Martin Hall
Auburn University
Auburn, Alabama 36830 Phone: 205-826-4784

Dr. K. Z. Morgan, Director
Health Physics Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee

J. M. Garner, Jr.

EXPERIENCE WITH RADIATION

When and Where Experience was Obtained:

Worked with radioisotopes from November 1942 to November 1971 at the Biochemical Research Foundation, Oak Ridge National Laboratory, Dougway Proving Grounds, Tennessee River System, Carswell Air Force Base, Army Nuclear Power facility at Fort Belvoir, Oak Ridge Institute of Nuclear Studies, American Nuclear Corp., Auburn University and US Army Electronics Command.

Type of Uses:

The work involved the production and processing of radioisotopes; research and development involving medical application in man, studies with animals and plants; environmental studies and measurements; water cooled reactor core changes and shipments; effects of radiation on materials; measurement of radiation; instrument calibration; waste disposal; teaching; and applied health physics.

Radioisotopes and amounts:

Do not remember all of the radioisotopes and maximum amounts that I have had experience with. The following table lists some of the information:

<u>Radioisotope</u>	<u>Amount</u>	
	<u>Unencapsulated</u>	<u>Sealed Sources</u>
Co-60	100,000 Ci	25,000 Ci
Co-57	2 uCi	
Co-137	5 Ci	120 Ci
Ra & Ra-Be	uCi	10 Ci
Pu-238 & Pu-Be	mCi	12 Ci
Pu-239	2 uCi	
Po-210 & Po-Be	3 Ci	10 Ci
Sr-90	2 Ci	2 Ci

<u>Radioisotope</u>	<u>Unencapsulated</u>	<u>Sealed Source</u>
P-32	200 mCi	
I-129	1 uCi	
I-131	50 mCi	
C-14	mCi	
H-3	mCi's	25 Ci (targets)
S-35	uCi's	
Cl-36	uCi	
Ca-45	uCi's	
Fe-59	50 uCi	
Zn-65	uCi	
Y-90	uCi's	
Au-198	60 mCi	
Nat Th	kg	
Nat U	10's of kg	
U-235	uCi	
Am-241	uCi	
Ir-192		10's of mCi

SUPPLEMENT 2

Military specification MIL-R-51305 (MU).

9 May 1969

MILITARY SPECIFICATION

RADIOACTIVE TEST SAMPLE, KRYPTON 85,

MX7338/PDR-27R

1. SCOPE

1.1 This specification covers one type of radioactive source encased in a copper capsule then sealed in a small aluminum rod.

2. APPLICABLE DOCUMENTS

2.1. Government documents. The following documents of the issue in effect on the date of invitation for bids or request for proposal form a part of this specification to the extent specified herein:

SPECIFICATIONS

FEDERAL

- PPP-B-601 - Boxes, Wood, Cleated Plywood.
- PPP-B-676 - Boxes, Set-Up, Paperboard.
- PPP-C-843 - Cushioning Material, Cellulosic.
- PPP-F-320 - Fiberboard, Corrugated and Solid, Sheet Stock, (Container Grade) and Cut Shapes.

MILITARY

- MIL-P-116 - Preservation, Methods of.
- MIL-M-19590 - Marking of Commodities and Containers to Indicate Radioactive Material.

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.

DRAWINGS

US ARMY MUNITIONS COMMAND

EDGEWOOD ARSENAL

- DLL24-12-6 - Radioactive Test Sample, Krypton 85, MX7338/PDR-27R.
- D150-2-1 - Marking Diagram for Shipping Containers.

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

UNIFORM CLASSIFICATION COMMITTEE

Uniform Freight Classification

(Application for copies of these ratings, rules and regulations should be addressed to Uniform Classification Committee, 202 Union Station, 516 West Jackson Boulevard, Chicago, Illinois 60606.)

CODE OF FEDERAL REGULATIONS

- 49 CFR 171-179 - Department of Transportation Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles.

(The Department of Transportation regulations are a part of the Code of Federal Regulations available from the Superintendent of Documents, Government Printing Officer, Washington, D. C. 20402. Orders for the above publication should cite "49 CFR 171-179.")

3. REQUIREMENTS

3.1 Materials and components.

3.1.1 Materials. All materials cited on Drawing DLL24-12-6 or on subsidiary drawings shall conform to the specifications listed thereon or to the specific characteristics set forth on the drawing.

3.1.2 Components. All components cited on Drawing DL124-12-6 or on subsidiary drawings shall conform to the specifications listed thereon or to the specific characteristics set forth on the drawing.

3.1.2.1 Radiation source. The source of radiation shall consist of 5 millicuries \pm 10 percent of Krypton 85, hermetically sealed in a copper capsule as specified on Drawing B124-12-8.

3.1.2.2 Hermetic seal. The capsule shall show no evidence of ~~air~~ leakage when submerged in a constant temperature bath as specified in 4.4.4.1. *Radioactive Leakage*

*NOR
ECP
2/2/50
od*

3.2 Manufacture and assembly. The radioactive test sample shall be assembled in accordance with Drawing C124-12-6.

3.3 Activity. The radioactive test sample shall have an activity of 5 millicuries \pm 10 percent ^{*effective*} when tested as specified in 4.4.4.2.

3.4 Mechanical shock. The activity of the radioactive test sample shall not vary more than \pm 5 percent from the initial activity after being subjected to the drop test as specified in 4.4.4.3. *Consult for Cu & Pt radiation attenuation*

3.5 Thermal shock. The activity of the radioactive test sample shall not vary more than \pm 5 percent from the initial activity after being subjected to three cycles of thermal shock as specified in 4.3.3.1.

3.6 Preproduction. Prior to the start of regular production, pre-production samples of the radioactive test sample shall be produced in accordance with this specification for examination and test (see 4.3.)

3.7 Workmanship. The radioactive test sample shall be free from cracks, dents, burrs, abrasions, faulty seals, and foreign matter (dirt, oil, and viscous material.)

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection.

4.1.1 Supplier's responsibility. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to specified requirements.

4.1.2 Objective evidence. The supplier shall provide objective evidence acceptable to the contracting officer that the requirements of 3.1 and section 5 for which specific inspection has not been provided in this specification have been satisfied.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) Preproduction inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

4.3 Preproduction inspection.

4.3.1 Sample. A preproduction sample of 50 radioactive test samples shall be manufactured using the same methods, materials, equipment, and processes as will be used during regular production.

4.3.2 Inspection procedure.

4.3.2.1 For examination and nondestructive tests. Each radioactive test sample shall be examined and tested for all requirements of the applicable drawings and this specification. Tests shall be performed in accordance with the number and sequence in Table I.

Table I. Preproduction Test Sequence

Item	Drawing	Sample size	Test
Capsule, Krypton 85	B124-12-8	50	Hermetic seal 4.4.4.1
Assembled Test Source	C124-12-6	50	Activity 4.4.4.2
Assembled Test Source	C124-12-6	25	Mechanical Shock 4.4.4.3
Assembled Test Source	C124-12-6	25	Thermal Shock 4.3.3.1

4.3.3 Tests.

4.3.3.1 Thermal shock. The 25 radioactive test samples from the 50 preproduction samples shall be subjected to a temperature of $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 2 hours. At the end of the 2 hour period the test samples shall be subjected to a temperature of $+50^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 2 hours. This procedure shall constitute one complete cycle of the thermal test. Three continuous cycles shall be performed. Upon completing the last cycle, the activity shall be determined in accordance with 4.4.4.2.

4.3.4 Acceptance/rejection criteria. The acceptance number for all tests shall be zero.

4.4 Quality conformance inspection.

4.4.1 Lotting. A lot shall consist of the radioactive test samples (Drawing CI24-12-6) produced by one manufacturer, at one plant, from the same materials, and under essentially the same manufacturing conditions.

4.4.2 Sampling.

4.4.2.1 For examination and nondestructive tests. Sampling shall be conducted in accordance with MIL-STD-105.

4.4.2.2 For mechanical shock. Sampling shall be conducted in accordance with MIL-STD-105, level S-3 and an AQL of 1.0 percent.

4.4.3 Inspection procedure.

4.4.3.1 For examination and nondestructive tests. The sample items and the level A preparation for delivery shall be examined and tested in accordance with the classification of defects and with MIL-STD-105.

4.4.3.2 For mechanical shock. Sample items shall be tested in accordance with 4.4.4.3 and with MIL-STD-105, level S-3 using an AQL of 1.0 percent defective for acceptance.

4.4.3.3 For critical defects. Each item in the lot shall be inspected for critical characteristics in the classification of defects.

4.4.3.4 Classification of defects.

(a) Radioactive test sample, Drawing C124-12-6.

<u>Categories</u>	<u>Defects</u>	<u>Acceptance standard</u>
<u>Critical:</u>		
1	Activity	4.4.4.2
2	Color missing from radioactive end	
3	Marking missing, illegible, incorrect or incomplete	
<u>Major:</u>		
	AQL 1.0 percent defective	
101	Body dimensions	
102	Body not properly sealed	
103	Chain missing	
104	Incorrect chain length	
105	Tag not firmly attached to sample	
106	Workmanship (see 3.7)	

(b) Capsule, Drawing B124-12-8.

<u>Categories</u>	<u>Defects</u>	<u>Acceptance standard</u>
<u>Critical:</u>		
1	Hermetic seal	4.4.4.1
<u>Major:</u>		
101	Length 1.203	

4.4.3.4 Classification of defects (continued)

(c) Preparation for delivery (section 5).

<u>Categories</u>	<u>Defects</u>
<u>Critical:</u>	
1	Marking of unit or shipping container illegible, incorrect, incomplete or not durable
<u>Major:</u> AQL 1.0 percent defective	
101	Unit or shipping container not as specified
102	Quantity of samples per unit or shipping container not as specified or indicated
103	Closure of unit or shipping container not as specified
104	Unit or shipping container damaged
105	Cushioning of shipping container not as specified

capsule done by lot

capsules for 6 days

check activity in container

CCC

4.4.4 Tests.

4.4.4.1 Hermetic seal. *Radioactive leakage* Submerge each capsule (Drawing B124-12-8) for a minimum of 60 seconds in a suitable constant temperature bath such as glycerine heated to $150 \pm 5^{\circ}\text{F}$. A steady-stream or recurrent succession of bubbles from the end of the capsule shall indicate leakage. *

4.4.4.2 Activity. *complete unit* The radioactive test sample (Drawing C124-12-6) shall be tested for activity using a calibrated scintillation or Geiger-Müller probe connected to a scaler or spectrometer. Each radioactive test sample shall be numbered and the activity level recorded (initial reading). *Count for attenuation Cu & K*

4.4.4.3 Mechanical shock. The radioactive test sample (Drawing C124-12-6) shall be tested by dropping from a height of 4 feet and impacting on a steel surface. Each radioactive test sample shall be dropped six times then subjected to the activity test 4.4.4.2 and the results recorded.

5. PREPARATION FOR DELIVERY

5.1 Packaging.

5.1.1 Level A. Radioactive test samples shall be individually packaged, method IC-3 of MIL-P-116, in a paperboard box, of optional type and class, conforming to PPP-B-676. The test sample shall be sufficiently cushioned to fill all voids with material conforming to PPP-C-843.

5.1.2 Level C. The radioactive test samples shall be packaged to afford adequate protection against deterioration and damage from the supply source to the first receiving activity for immediate use.

5.2 Packing. *Change in salubritation*

5.2.1 Level A. Radioactive test samples, packaged as specified in 5.1.1, shall be packed in a quantity not to exceed the applicable requirement specified in Department of Transportation (DOT) regulations 49CFR 171-179 in a cleated plywood box conforming to overseas type, style J of PPP-B-601, for a type 2 average load. Unless otherwise specified, the plywood shall be provided with water repellent preservative treatment as specified in PPP-B-601, in addition, wood cleats shall be immersed for a minimum of three minutes in the same preservative as that specified for the plywood (see 6.2). Each inside face of the wood box shall be lined with fiberboard sheets conforming to grade W5c of PPP-F-320. Additional sheets shall be added as required to assure a tight pack. Boxes shall be closed and strapped using galvanized strapping as specified in the appendix to PPP-B-601.

5.2.2 Level C. Radioactive test samples, packaged as specified in 5.1.2, shall be packed in accordance with applicable requirements specified in DOT regulation 49 CFR 171-179 to insure carrier acceptance and safe delivery to the first domestic destination. Containers shall comply with Uniform Freight Classification rules or regulations of other carriers applicable to the mode of transportation.

5.3 Marking. In addition to any special marking required by the contract or order, unit packages shall be marked in accordance with MIL-STD-129, DOT regulation 49 CFR 171-179 and MIL-M-19590. Shipping containers shall be marked as shown on Drawing D150-2-1.

6. NOTES

6.1 Intended use. The radioactive test samples covered by this specification are intended to provide a radiation source that permits the operator to ascertain the operating condition of AN/PDR 27 radiac set when no known radiation field is available.

6.2 Ordering Data. Procurement documents should specify the following:

- (a) The title, number, and date of this specification.
- (b) Level of packaging and packing required.
- (c) Quantity required in each shipping container.
- (d) When wood preservative is not required on shipping container.

6.3 Caution. Care should be exercised to prevent injury to personnel engaged in handling and testing radioactive sources. The National Bureau of Standards handbook (NBS No. 73) and Atomic Energy Commission Regulation 10 CFR 20-40 contain information pertaining to protection of personnel from radioactive emanations.

Custodian:

Army - MU

Preparing activity:

Army - MU (EA)

Project No. 6665-A217

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 27-10287

INSTRUCTIONS: This sheet is to be filled out by personnel other than Government or contractor personnel engaged in the use of the specification in procurement of products for ultimate use by the Department of Defense. This form is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the lowest cost. Comments and the return of this form will be appreciated. Fill in lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document or to serve to amend contractual requirements.

SPECIFICATION

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A
 DIRECT GOVERNMENT CONTRACT SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
 A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCY

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?
 YES NO (If "yes", in what way?)

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)

SUBMITTED BY (Printed or typed name and activity - Optional)

DATE

TO DETACH FORM - CUT ON THIS LINE

FOLD

POSTAGE AND FEES PAID

OFFICIAL BUSINESS

Commanding Officer
Edgewood Arsenal
ATTN: SMUEA-QAES
Edgewood Arsenal, Maryland 21010

FOLD

48187

6
5
4
3
2
1

ITEM NO.

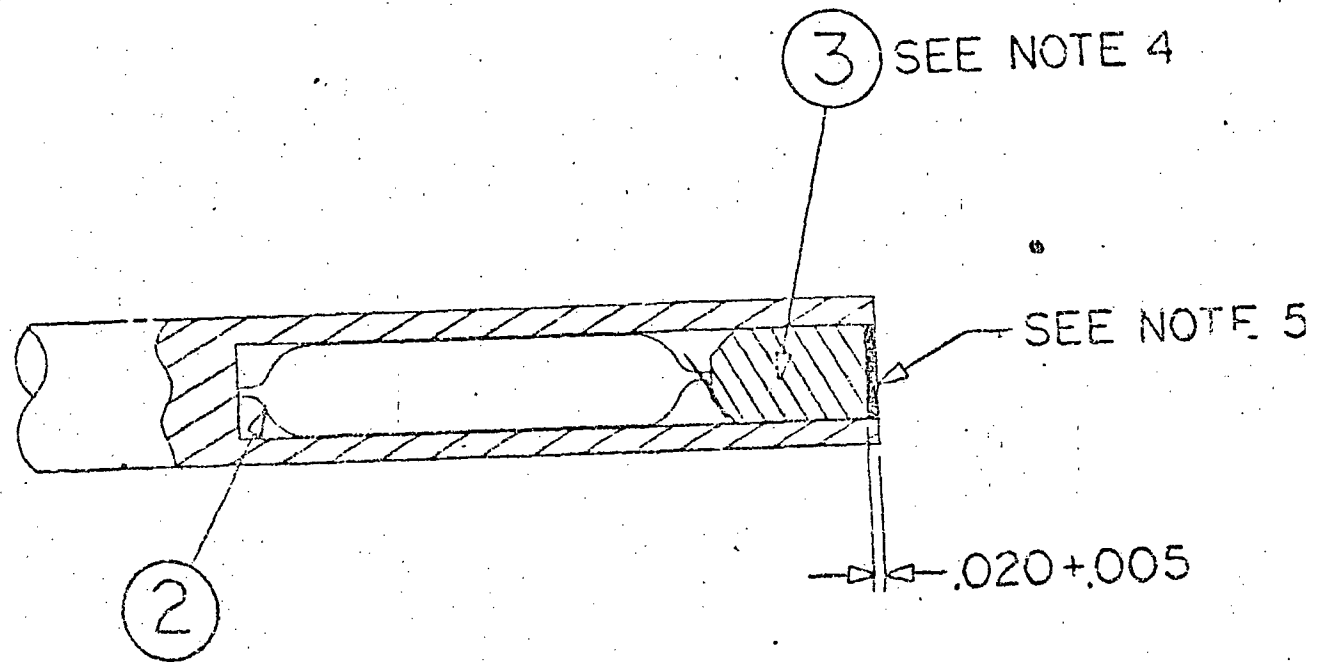
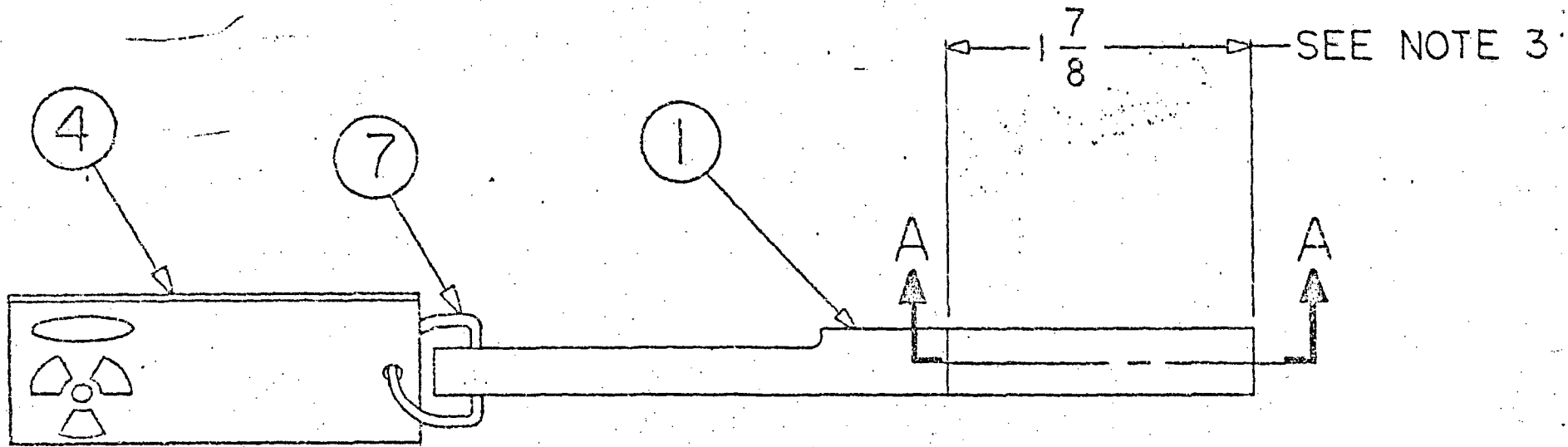
1		RING, DEE: CLASS 2, SIZE 9/16 X 7/16 X .0625 NOM THK, CAD OR ZINC PLATED	MIL-R-3390	
-		ANODIC COATING	MIL-A-8625	
-		ADHESIVE, EPOXY RESIN, TYPE I	MIL-A-8623	
-		LACQUER, ACRYLIC, COLOR PURPLE	MIL-L-81352	
1	B124-12-10	IDENTIFICATION TAG		
1	124-12-9	PLUG		
1	B124-12-8	CAPSULE		
1	B124-12-7	BODY		
TY QD	DRAWING OR PART NO.	NOMENCLATURE	MATERIAL	SPECIFICATION

LIST OF MATERIALS

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES UNLESS OTHERWISE SPECIFIED ANGLES ON: 2 PLACE DECIMALS ± .04 3 PLACE DECIMALS ± .010 FRACTIONS ± 1/16 ANGLES ± 0°30'	ORIGINAL DATE OF DRAWING 26 APR 1968		DEPT OF THE ARMY U. S. ARMY EDGEWOOD ARSENAL EDGEWOOD ARSENAL, MARYLAND			
	DRAFTSMAN R. L. E.	CHECKER <i>VB</i>				GR LEADER
	SUBMITTED <i>Charles De Rosa</i>			RADIOACTIVE TEST SAMPLE, MX7338 / PDR-27R		
	APPROVED <i>M J Schumacher</i>					
MATERIAL	APPROVED BY ORDER OF CG <i>A. Stewig</i>		CODE IDENT NO. 81361	SIZE C	IDENT NO. C124-12-6	
			SCALE 1/1	SHEET		

NOTES:

1. THIS DRAWING SHALL BE INTERPRETED IN ACCORDANCE WITH APPLICABLE STANDARDS LISTED IN MIL SPEC MIL-D-1000.
2. THE FOLLOWING ARE MANDATORY WHEN INDICATED BY ~~■~~
 - REMOVE BURRS BREAK SHARP EDGES .010 MAX
 - FILLETS .010 MAX R.
 - $125^\circ V$ ALL OVER, EXCEPT AS NOTED
 - DIMENSIONS APPLY AFTER PLATING
 - TOLERANCES ON STOCK MATERIAL SIZES, SHALL BE AS SPECIFIED IN APPLICABLE SPECIFICATIONS.
3. APPLY ITEM 5 FOR DISTANCE INDICATED
4. APPLY ITEM 6 AROUND ITEM 3 AND PRESS FIT ITEM 3 INTO ITEM 1.
5. SEAL ASSEMBLY WITH ITEM 6. SEALED END OF ASSEMBLY SHALL BE FREE OF EXCESS EPOXY RESIN AND SMOOTH.
6. FOR LEAKAGE TEST AND ADDITIONAL REQUIREMENTS SEE END ITEM SPEC MIL-R-51305.



SECTION A-A

SCALE $\frac{2}{1}$



SUPPLEMENT 3

TM 3-6665-264-10 (Draft), the Operator's Manual for Radioactive Test
Sample: Krypton 85, Gamma, MX 7338/PDR-27R.

DEPARTMENT OF THE ARMY TECHNICAL MANUAL

OPERATOR'S MANUAL
RADIOACTIVE TEST SAMPLE: KRYPTON 85, GAMMA, MX7338/PDR-27R

Headquarters, Department of the Army, Washington, D.C.

SAFETY PRECAUTIONS

When handling the MX7338/PDR-27R radioactive test sample, avoid prolonged exposure to the radiation; do not unchain the test sample from the carrying case except for disposal purposes.

Handle the test sample by the flat (inactive) end only. Protect stored radioactive test sample against unauthorized removal.

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Section 1. GENERAL

1. Scope

This manual contains a description of the Radioactive Test Sample: Krypton 85, MX7338/PDR-27R and information on its use; instructions for handling, storing, and disposing of damaged or unwanted test samples; and actions to be taken in emergency situations.

2. Reporting of Equipment Publication Improvements

Reporting of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to DA Publications) and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-SS, Fort Monmouth, N. J. 07703.

3. Use

The MX7338/PDR-27R radioactive test sample is used as a check source to determine if the electrical circuit of an AN/PDR-27() radiac set is functioning properly. Detailed instructions for using the radioactive test sample are given in TM 11-6665-230-15.

Note. The MX7338/PDR-27R radioactive test sample can be used interchangeably with the MX1083/PDR-series radioactive test samples.

4. Authorization for Issue

MX7338/PDR-27R gamma Krypton 85 radioactive test samples are issued throughout the Army without a specific license being required by the user. This is made possible by statements and conditions set forth in ^{an} the Atomic Energy Commission Byproduct Material License No. 19-1826-2 issued to the licensee, Department of the Army, ATTN: AMSEL-SF-H, US Army Electronics Command, Fort Monmouth, N. J. 07703.

5. Supervision

a. The handling, storage, transfer, use, and disposal of an MX7338/PDR-27R radioactive test sample shall be under the guidance of the installation or activity (local) radiation protection officer. An individual who has completed the annual Chemical-Biological-Radiological training requirements, or its equivalent, is considered qualified to supervise the use of the test sample and act as radiation protection officer for the item.

b. Each organization that is authorized a test sample shall assign a qualified person to be directly responsible for the item. This individual shall be familiar with principles and practices of radiation measurement and protection.

Section 11. DESCRIPTION AND DATA

6. Description

The MX7338/PDR-27R radioactive test sample (fig. 1) is an aluminum wand approximately 3/8 inch in diameter and 5 inches in length. A sealed radioactive source containing approximately 5 millicuries of Krypton 85 (Kr85) is sealed in the cylindrical or active end (4) of the wand; the active end is painted purple. An identification tag (1) is attached to the flattened or inactive end (3) of the wand by a D-ring (2); the inactive end is marked MX7338/PDR-27R. The D-ring also serves as a means of attaching the radioactive test sample to a chain in the carrying case of the AN/PDR-27() radiac set. While not in use, the radioactive test sample is stored in a well in the carrying case.

7. Tabulated Data

Type of radiation	Gamma
Quantity (approx.)	5 millicuries
Radioactive material	Kr 85
Half life	10 years

Section 111. INSPECTION AND TESTING FOR LEAKS

8. General

If the radioactive test sample develops a leak because of gross damage or deterioration, Krypton 85 will dissipate into the air without causing surface contamination.

9. Inspection

Inspect radioactive test sample when issued and each time thereafter that the sample is used to make sure that it is not damaged or deteriorated and that the meter reading on the 50 MR/hr scale of the AN/PDR-27() radiac set is at least 10 MR/hr. If the meter reading is below 10 MR/hr on the 50 MR/hr scale, double check the functioning of the instrument without the radioactive test sample, using the procedure given in TM 11-6665-230-15. If the double check shows the radioactive test sample to be defective, open the D-ring (2, fig. 1) and remove the test sample from the chain. Dispose of the sample and identification tag as directed in paragraph 10, 13, or 11, whichever is applicable.

Section IV. STORAGE

11. General

Radioactive test samples are numbered serially to permit control of supply and issue. They are not individually controlled items as defined in AR 725-1 Chapter 3. Accountability for radioactive test samples must be maintained by serial number only. (Loss of radioactive test sample must be reported as described in para 15c and an unwanted or unserviceable test sample must be disposed of through a radioactive material disposal facility as described in paragraphs 13 and 14.) Protect stored radioactive test samples against unauthorized removal.

12. Bulk Storage

Bulk storage is authorized only at depots ^{Designated} designed by the national inventory control point. Designated depots will be equipped with storage and disposal facilities for radioactive materials. The depots will be supported by a health physicist or a qualified radiation protection officer.

Section V. DISPOSITION OF UNWANTED OR UNSERVICEABLE RADIOACTIVE TEST SAMPLES

13. Disposition of Test Samples in CONUS

In CONUS turn in unwanted or unserviceable M7228/PDR-27R radioactive test samples to a radioactive material disposal facility in accordance with AR 755-15. Obtain disposal instructions directly from Commander, US Army Electronics Command, ATTN: AMSEL-SF-H, Fort Monmouth, NJ 07703.

Note. Although the radioactivity is greater than 10MR/hr when checked with an AN/PDR-27() radiac meter, the radioactive test sample is considered un-serviceable if the identification tag is damaged, unreadable, or missing, or if the aluminum wand is crushed or corroded.

14. Disposition of Test Samples Overseas

At oversea establishments, follow the disposition procedures established by the responsible commander.

Section VI. EMERGENCY SITUATIONS AND ACTIONS TO BE TAKEN

15. Loss of Test Sample

a. Attempt to recover test sample.

(1) Review records to determine the responsible individual.

(2) Make a physical survey.

b. If the test sample is recovered, revise procedures as necessary to prevent a recurrence.

c. If the test sample is not recovered, report the loss within 25 days through command channels to the major command radioactive material control point and state the serial number of the sample, the circumstances involved, and the procedures taken to prevent a recurrence.

16. Internal Exposure of Personnel

Internal exposure of personnel resulting from ingestion, inhalation, or absorption of radioactive material, generally associated with damaged or leaking sources, does not apply to this source.

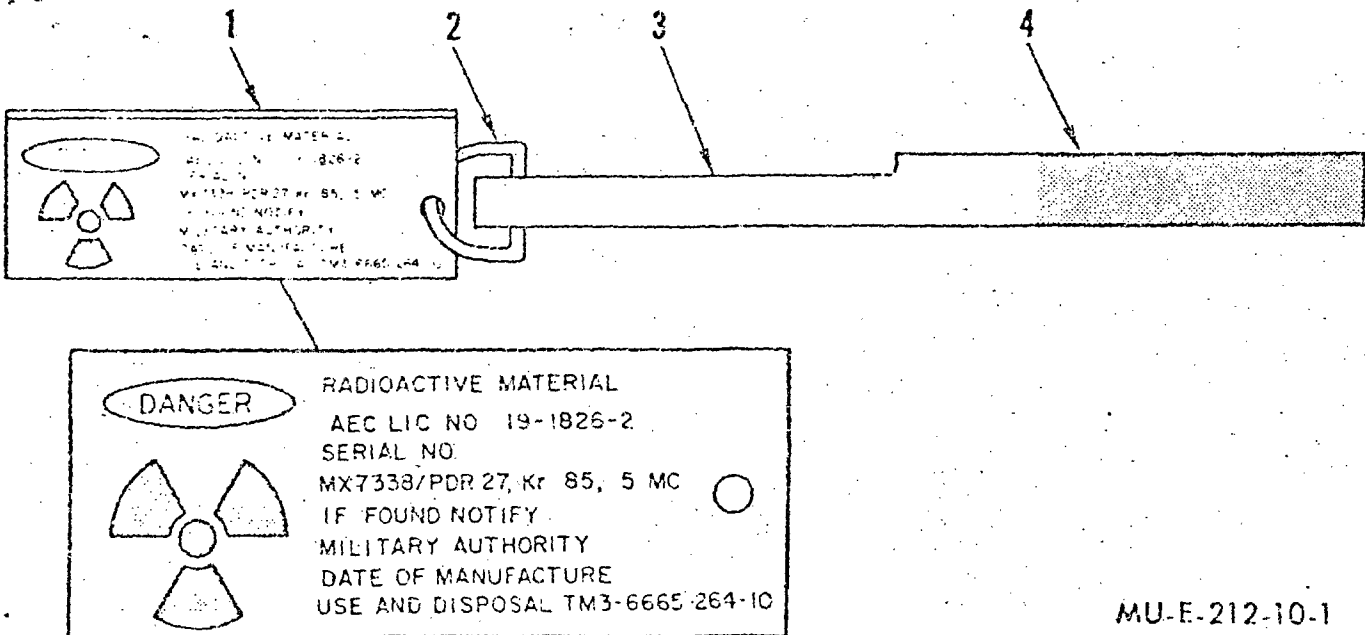
17. External Overexposure of Personnel

- a. External overexposure of personnel can occur if the test sample is in direct contact with the skin for prolong periods.
- b. Action required in the event of a known or suspected overexposure is -
- (1) Seek advice from the Medical Officer.
 - (2) If the external exposure is suspected, calculate the exposure by multiplying the length of exposure (in hours) by 10 MR/hr and annotate DD Form 1141 (Record of Occupational Exposure to Ionizing Radiation).
 - (3) Correct procedures to prevent a recurrence.
 - (4) Notify responsible commands and Commander, US Army Electronics Command, ATTN: AMSEL-SF-H, Fort Monmouth, NJ 07703.

APPENDIX

REFERENCES

- AR 725-1 Special Authorization and Procedures for Issues, Sales, and Loans.
- AR 755-15 Disposal of Unwanted Radioactive Material
- TM 11-6665-230-15 Organizational, DS, GS, and Depot Maintenance Manual (Including Organizational Maintenance Repair Parts and Special Tool Lists): Radiac Set, AN/PDR-27R.



MU-E-212-10-1

Figure 1. MX7338/PDR-27 Radium Krypton 85 radioactive test sample.

- 1 Identification tag
- 2 D-ring
- 3 Inactive end
- 4 Active end

SUPPLEMENT 4

Training and Experience of individual users.

TRAINING AND EXPERIENCE OF INDIVIDUAL USERS
OR DIRECT SUPERVISORS OF USERS

1. Direct supervision - users. Requirements for training and experience of individual users or their direct supervisors are established in paragraph 5, TM-3-6665-264-10 (Supplement 3).
2. Direct supervision - depot stocks. Training and experience of Radiation Protection Officers for depot storage will, as a minimum, meet requirements of the technical manual. Qualifications of current depot Radiation Protection Officers exceed those requirements. The U.S. Army Electronics Command National Inventory Control Point provides authorization for issue by depots maintains records of item procurement location and disposal.
3. Staff supervision. Use of the items is controlled through staff supervisory radioactive material technical channels as established by Chapter 3, AR 725-1. Overall technical staff supervision is provided by the Radiation Protection Officer(s) named in item 5 (AEC Form 313) through Radiological Control Officer(s) at each major Army Command who implement control procedures through Radiation Protection Officers as subordinate elements down to and including local installations and activities. See paragraph 1-4, Chapter 1, AR 727-1 for minimum qualifications of the latter named positions.

SUPPLEMENT 5

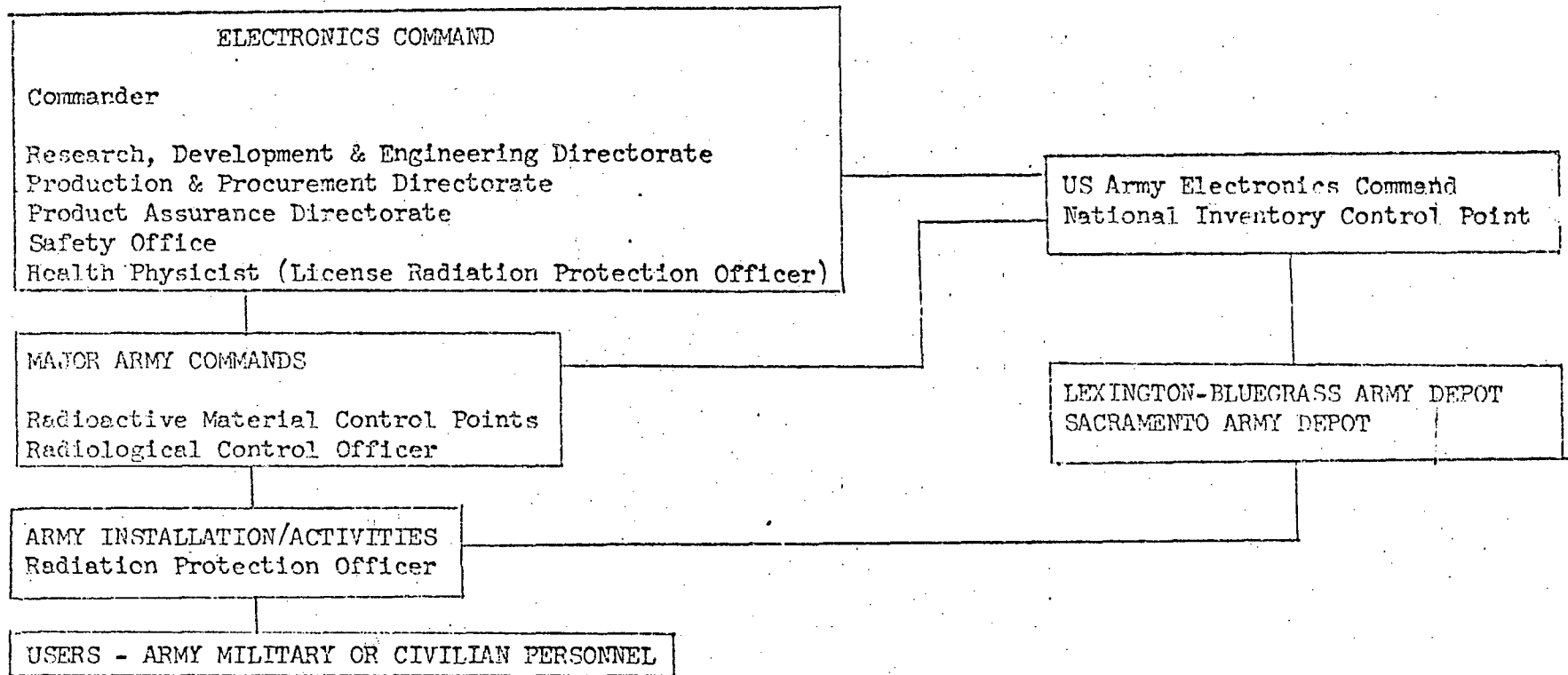
Radiation protection program.

48187

RADIATION PROTECTION PROGRAM

There will be no significant change in the radiation protection program as administered under this license from the way it is being administered under license No. 19-01826-02. The attached chart describes radioactive material control channels for the MX 7338 test samples. Control and supervision at the local level is described in paragraph 5 of TM 3-6665-264-10 (Supplement 3). Control and supervision at depots is described in USAMUCOM DMWR 3-6665-264 (Supplement 7).

SAFETY AND CONTROL ORGANIZATIONAL CHART*



*This chart does not delineate a chain-of-command organizational structure. It does represent technical safety and control measures to be used for test samples.

HOW THE ARMY SUPPLY SYSTEM WORKS

1. Once an item of supply is designed it is controlled from its birth until final disposal through a series of army regulations. The first step after design is to catalog item. Catalog description includes numerous information which is placed on microfilm. Microfilms are distributed to supply officers at each installation and activity throughout the Department of Defense (CONUS and overseas). Information included in the microfilm is as follows: Federal stock number, nomenclature, unit of issue, unit price, financial inventory code, requisitioning source, class manager, type class code, reportable item control code, expendability/recoverability code, special item control code, (radioactive material is coded 8, A or B), supply status code, phrase code, unit package quantity, related federal stock number, catalog of maintenance symbol, and combat essentiality code.
2. After an item is cataloged it is assigned to a class manager at the national level (USAAPSA) who is responsible for perpetuation and maintenance of current management data for use in the establishment and maintenance of records essential to the acquisition, storage, control, reporting, maintenance, distribution and ultimate disposal.
3. When a requirement arises at the installation level for an item it is the responsibility of the station accountable property officer to submit a funded requisition to the army class manager at the national level (USAAPSA) to obtain the item. Requisitions for individually controlled radioactive items are coordinated with the installation or activity radiation protection officer and are forwarded through the major command radioactive material control point to the class manager.

The class manager then directs the appropriate depot to ship the item. Upon receipt, the accountable property officer at the installation level maintains control of all nonexpendable items (which includes all licensed radioactive items) while in use through the media of a property book. These items are inventoried on at least an annual basis and any shortages are investigated thoroughly. If investigation warrants, a report of survey is prepared which is investigated by a survey board appointed by the commanding officer to fix responsibility for the loss.

4. When an item becomes excess or is no longer required by the installation it is reported to USAAPSA for final disposal instruction.

USAAPSA will then provide the accountable property officer with disposition instructions. This instruction could be to return the item to supply system for future requirement or in the case of radioactive material, he could tell the accountable property officer to report for disposition in accordance with AR 755-15. Under no circumstances is a radioactive item released to the public.

The ECOM Safety Office, Health Physics section, will insure that government inspectors performing preproduction inspections and quality conformance inspections in conformance with paragraphs 4.3 and 4.4 of MIL-R-51305 are adequately trained to properly perform these inspections. All pertinent training of government inspectors in this regard will be evaluated by ECOM Safety Office, Health Physics section.

SUPPLEMENT 6

LOCATIONS WHERE RADIOACTIVE TEST SAMPLE WILL BE USED

1. Field Sites. Items will be used at U.S. Army sites in support of troop training, instrument calibration and as check sources for checking instrument electronics. Issue is controlled by Army requisitioning procedures through the U.S. Army Electronics Command National Inventory Control Point who authorizes issue by the storage depots and maintains central location records. Items are issued as a component of the Radiac Set AN/PDR-27() or as a replacement part thereof. Specific location of each item is maintained by each major command.

2. Depot. Items awaiting distribution to the field will be held in storage areas at:

- a. Lexington-Bluegrass Army Depot
Lexington, Kentucky
- b. Sacramento Army Depot
Sacramento, California

SUPPLEMENT 7

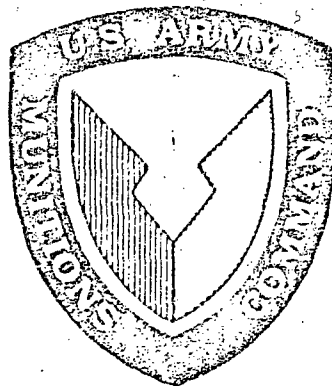
USAMUCOM DMWR 3-6665-264

USAMUCOM DMWR 3-6665-264

DEPOT MAINTENANCE WORK REQUIREMENTS

FOR

RADIOACTIVE TEST SAMPLE: KRYPTON 85,
GAMMA, MX 7338/PDR-27(R)



HEADQUARTERS, US ARMY MUNITIONS COMMAND

JANUARY 1969

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CHAPTER 1

INTRODUCTION

Section I. . PURPOSE AND SCOPE

1-1. Radioactive Test Sample: Krypton 85, Gamma, MX7338/PDR-27(R) is a non-maintenance type item. The purpose of this DMWR is to provide instructions for controlled modification of the test sample. Additional instructions are provided herein for inspection and preparation for storage and shipment.

1-2. Procedures supplied in this DMWR which are independent of other procedures may be performed in any order desired to facilitate operational requirements. Procedural changes shall not be made if required tests or inspections will be invalidated, or safety features violated.

1-3. Report accomplishment of modification by item serial number to:
Commanding General, US Army Ammunition Procurement & Supply Agency,
ATTN: SMUAP-F, Joliet, Illinois 60436.

1-4. Forward comments on errors or omissions in this manual to:
Commanding General, US Army Ammunition Procurement & Supply Agency,
ATTN: SMUAP-F, Joliet, Illinois 60436.

CHAPTER 2

PREPARATION FOR STORAGE AND SHIPMENT

Section I. GENERAL

2-1. a. If AN/PDR 27R Radiac Set and Case is available, attach chain (saddle and punch method) to convenient spot on the wall divider for the foam block compartment within the radiac case.

b. If no AN/PDR-27R Radiac Set and Case is available, repack test sample and store for future use.

Section II. SAFETY PRECAUTIONS

2-2. a. Each depot which stores bulk quantities of radioactive test samples will be supported by a radiation protection officer who will have completed at least 40 hours of radiological instruction at the CBR School, Ft. McClellan, Alabama or its equivalent i.e. Basic Radiological Health Course, given by US Public Health Service.

b. Store test samples in a secured fire resistant and well ventilated building apart from flammable or combustible material or explosives.

c. The storage area must be posted with a sign which states - Caution - Radioactive Material. In addition, if the radiation dose rate at the most accessible outer surface of the storage area exceeds

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2.5 milliroentgen per hour, the area must be posted with a sign which states - Caution - Radiation Area. At no time should the dose rate at this outer surface of the storage area exceed 5 milliroentgens per hour.

d. Film badges will be provided for individuals who are routinely working in the area and who could receive an exposure in excess of 125 milliroentgens in 13 weeks.

e. (1) Individuals who will be routinely working with the radiac sets and/or test samples will be given a health physics orientation by the radiation protection officer. This will include, reviewing their knowledge of the operations, briefing them on the use of film badges and interpretation of meter readings, explaining the potential hazards of working with Krypton-85, and explaining emergency procedures.

(2) A pre-employment and periodic physical examination will be required of individuals as specified in AMCR 385-25.

f. Under no conditions will the test samples be declared excess and released to the general public. All disposal action must be in accordance with AR 755-15.

CHAPTER 3

WORK REQUIREMENTS

Section I. MODIFICATION

3-1. Purpose

To install Dee Ring with identification tag including chain for attaching test sample to AN/PDR-27R Radiac Set. Remove and discard existing identification tape from test sample.

3-2. Supply of Parts Required

- a. Identification Tag, Edgewood Arsenal Drawing No. B124-12-10.
- b. Dee Ring, Edgewood Arsenal Drawing No. C124-12-6, MIL-R-3390.
- c. Chain, Edgewood Arsenal Drawing No. 124-12-18, except that length is changed from $5\text{-}3/4 \pm 1/8$ to $24 \pm 1/8$ inches.

3-3. Modification Procedures

- a. Locate and drill $.093 \pm .006$ inch diameter hole as shown in Edgewood Arsenal Drawing No. B124-12-7.
- b. Transfer serial number from existing identification adhesive tape on test sample to new metal identification tag.
- c. Place new metal identification tag and chain on Dee Ring and attach through new hole drilled on test sample.

d. Remove and discard existing identification adhesive tape from test sample.

e. Work with one test sample at a time keeping the remaining test samples at least 5 feet away from the operator.

3-4. Safety Precautions

a. Handling of the test samples during modification will be under the supervision of the installation radiation protection officer who will be guided by the provisions specified in Title 10 Code of Federal Regulations, Part 20 (Standards for Protection Against Radiation). Beta-gamma film badges and dosimeters (0 - 200 milliroentgen) will be worn by personnel performing the modification. A suction hood which draws air away from the operator will be used during drilling operations. Operations other than drilling may be done in a well ventilated area. The total exposure to the hands and body of personnel shall be limited to 18-3/4 and 1-1/4 rem per quarter respectively.

b. Operators performing the modification must be given an orientation by the radiation protection officer to make sure that the procedures and safety requirements are understood. The reason for using personnel dosimetry devices, the potential hazards associated with radioactive material, and the actions to be taken in an emergency should be explained.

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c. (1) A radioactive gaseous release will result if the active end of the test sample is accidentally drilled. The operator should immediately leave the area and notify the radiation protection officer.

(2) An emergency could result if the test sample is dropped or crushed in which case use an AN/PDR-27() survey meter to check the source. If the reading is below 10 Mr/Hr when the test sample is placed directly against the smaller probe, it can be assumed that the item is leaking and immediate evacuation should take place.

(3) Report any incident of gaseous leakage or external over-exposure to the Commanding Officer, Edgewood Arsenal, ATTN: SMUEA-SA, Edgewood Arsenal, Md., 21010. (During duty hours, telephone area code 301, telephone number 676-1000, extension 21291, autovon number 231-1360, extension 21291.)

CHAPTER 4

QUALITY ASSURANCE PROVISIONS

Section I. LOTTING

4-1. Lotting. Radioactive test samples are numbered serially to permit control in supply and issue. Accountability for radioactive test samples must be maintained in accordance with AR 735-5.

Section II. ACCEPTANCE REQUIREMENTS

4-2. Sampling. Sampling shall be in accordance with MIL-STD-105.

4-3. Inspection and Test. Each test sample shall be inspected and tested in accordance with Table I Classification of Defects using the method and AQL as indicated.

Table I (Dwg C124-12-6)

<u>Categories</u>	<u>Defects</u>	<u>Inspection Method</u>
Critical	Non-defined	
Major	AQL 1.5 percent defective	
101	Activity	Par 5.4
Major	AQL 2.5 percent defective	
102	Tag not firmly attached to sample	Visual

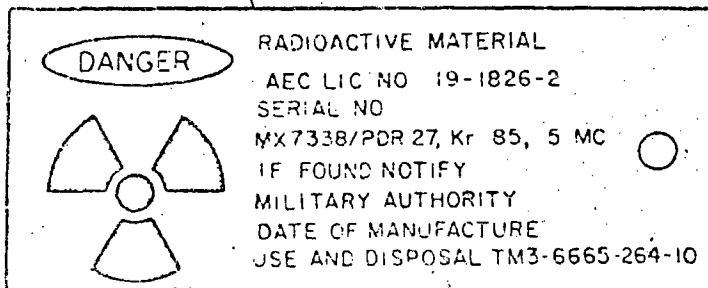
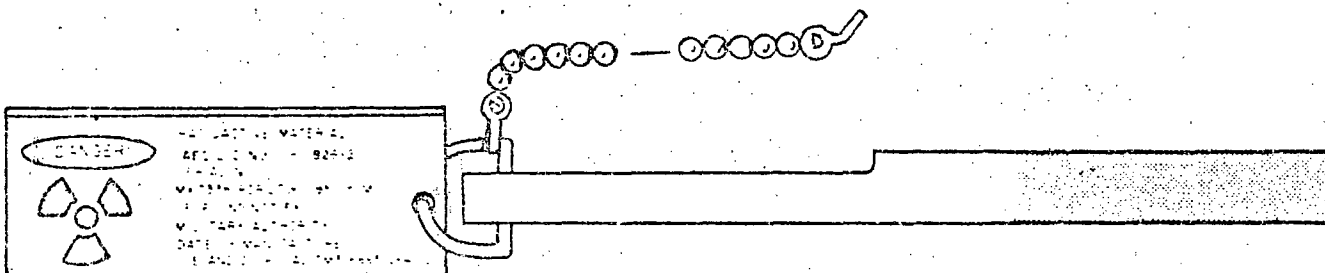
<u>Categories</u>	<u>Defects</u>	<u>Inspection Method</u>
103	Marking illegible or incorrect (Dwg B124-12-10)	Visual
104	Test sample damaged.	Visual
105	Purple end damaged	Visual
106	Foreign matter or contamination (dirt, grease, etc.)	Visual

4-4. Test. Using a calibrated AN/PDR-27R radiac-meter at the 50 mr/hr range, test each sample for activity as follows:

Place the active end (purple) of the test sample flat against the smaller cylinder of the probe. The meter reading should indicate an activity of at least 10 mr/hr.

Section III. SPECIAL INSTRUCTIONS

4-5. Equipment Calibration. Prior to inspection or test, all measuring devices that require calibration will be inspected to verify that the calibration and equipment limits have not been exceeded.



MU-E-212-10-1

Figure 1. Modified Radioactive Test Sample MX7338/PDR-27(R)

SUPPLEMENT 8

These instruments will be calibrated with the TS-784 as indicated in AEC license 29-01022-09 or with Cobalt-60 or Cesium-137 sealed sources that are either calibrated by NBS or by calibrated R-meter, traceable to NBS by direct comparison.