NRC FORM 313
(10-87)
10 CFR 30, 32, 33, 34, 35 and 40

U.S. NUCLEAR REGULATORY COMMISS
APPROVED BY OM
3150-0120
Expires: 6-30-90

APPLICATION FOR MATERIAL LICENSE

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATIONS FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF FUEL CYCLE AND MATERIAL SAFETY, NMSS
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS. IF YOU ARE LOCATED IN:

CONNECTICUT, DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION I
NUCLEAR MATERIALS SAFETY SECTION B
475 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION II
NUCLEAR MATERIALS SAFETY SECTION
101 MARIETTA STREET, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION III
MATERIALS LICENSING SECTION
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
MATERIAL RADIATION PROTECTION SECTION
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TX 76011

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON, AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION V
NUCLEAR MATERIALS SAFETY SECTION
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CA 94596

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERI/ IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTION.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- [ ] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER _____
- [X] C. RENEWAL OF LICENSE NUMBER 45-00953-01

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include Zip Code)*

US Army Belvoir Research, Development
and Engineering Center
ATTN: STRBE-VR
Ft. Belvoir, VA 22060-5606

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED

US Army Belvoir Research, Development
and Engineering Center
Fort Belvoir, VA 22060-5606

US Army Center for Night Vision and
Electro-Optics
Fort Belvoir, VA 22060-5677

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Michael D. Funkhouser

TELEPHONE NUMBER

(703) 664-5437/5133

SUBMIT ITEMS 5 THROUGH 11 ON 8½ x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

5. RADIOACTIVE MATERIAL
a. Element and mass number, b. chemical and/or physical form, and c. maximum amount which will be possessed at any one time.

See narrative

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

See narrative

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE.

See narrative

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

See narrative

9. FACILITIES AND EQUIPMENT.

See narrative

10. RADIATION SAFETY PROGRAM.

Belvoir RDE Center SOP 385-11

11. WASTE MANAGEMENT.

See narrative

12. LICENSEE FEES *(See 10 CFR 170 and Section 170.31)*

FEE CATEGORY N/A

AMOUNT ENCLOSED $

13. CERTIFICATION. *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT, NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, AND 40 AND THAT ALL INFORMATION CONTAINED HEREIN, IS TRUE AND CORRECT TO THE BEST OF THEIR KNOWLEDGE AND BELIEF.

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.

SIGNATURE–CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
	PETER J. CAHILL	Colonel, EN Commanding	31 MAR 1989

9001160304 890906
REG2 LIC30
45-00953-01 PDR

FEE EXEMPT

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS	APPROVED BY

AMOUNT RECEIVED	CHECK NUMBER		DATE

Item 5 - MATERIAL TO BE POSSESSED

	a Element and mass number:	b Chemical and/or physical form:	c Maximum amount:
1.	Any byproduct material of atomic numbers 5 through 95, inclusive.	Sealed: any chemical or physical form as any gauge, device, calibrated or reference standard, or Department of the Army commodity, device, gauge, indicator, meter, or tube.	Not to exceed 5 curies per radionuclide and 10 curies of total activity.
2.	Hydrogen-3.	Sealed luminous sources: gas, paint, or phosphor, as any calibrated or reference standard, EXIT sign, or Department of the Army commodity, compass, device, gauge, indicator, or meter.	Not to exceed 25 curies per source and 500 curies of total activity.

Item 6 - PURPOSE FOR WHICH LICENSED MATERIAL WILL BE USED

1. Byproduct material of generally less than one microcurie per source will be used for calibration, quality control, and reference check of non-portable gas flow proportional counters, gamma spectrometers, and liquid scintillation counters.

2. Byproduct material of generally less than 100 millicuries per source as received and incorporated in moisture density gauges, gas chromatographs, photometers, smoke detectors, surge arresters, and otherwise incorporated in commercially available products or Department of the Army devices, gauges, indicators, and meters, will be used in accordance with manufacturer's or Department of the Army specifications as appropriate.

3. Byproduct material of generally less than 1 curie per source of either americium-241, cobalt-60, or cesium-137 as incorporated into Department of the Army devices will be stored for purpose of disposal in accordance with Federal regulations.

4. Hydrogen-3 as received and incorporated in Department of the Army compasses, EXIT signs, gauges, indicators, meters, or radioluminescent devices will be tested, measured, developed, or evaluated for quality assurance and quality control in accordance with published Department of the Army specifications and military standards, and American National Standards Institute.

Item 7 - INDIVIDUALS RESPONSIBLE FOR RADIATION SAFETY - - THEIR TRAINING AND EXPERIENCE

1. MICHAEL D. FUNKHOUSER, Radiation Protection Officer, US Army Belvoir Research, Development, and Engineering Center and US Army Center for Night Vision and Electro-Optics, Fort Belvoir, Virginia.

a. Education:

(1) 1965-67, Associate of Science in Physics, Young Harris Junior College, Young Harris, Georgia.

(2) 1967-69, Bachelor of Science in Physics, University of Florida, Gainesville, Florida.

(3) 1977-78, Master of Science in Applied Nuclear Science in Health Physics, Georgia Institute of Technology, Atlanta, Georgia.

b. Experience:

(1) 1977-78, Student, worked with radionuclides and radiation detecting equipment, performed laboratory exercises, collected and analyzed data at 5-megawatt research reactor under the supervision of the instructors and staff at the Georgia Institute of Technology.

(2) 1978-79, Health Physicist, US Army Electronics-Communication Command, Fort Monmouth, New Jersey, formally US Army Communications and Electronics Materiel Readiness Command. Performed administrative health physics and surveyed command depots that stored, used, and transported US Nuclear Regulatory Commission byproduct source, and special nuclear materials.

(3) 1979-81, Health Physicist and Radiation Protection Officer, Harry Diamond Laboratories, Adelphi, Maryland. Leak tested and surveyed 25,000 curie-colbalt-60-irradiator, curie, and millicurie quantities of hydrogen-3, carbon-14, chlorine-36, cobalt-60, nickel-63, strontium-90/ytterium-90, cesium-137, barium-137m, promethium-147, thallium-294, lead-210, bismuth-214, radium-226, and microcurie quantities of accelerator produced radionuclides.

(4) 1981-Present, Health Physicist and Radiation Protection Officer (1983), US Army Belvoir Research, Development, and Engineering Center and US Army Center for Night Vision and Electro-Optics, Fort Belvoir, Virginia. Writes and executes the Belvoir Research, Development, and Engineering Center Standing Operating Procedure Number 385-11. Performs leak tests, surveys, and evaluation of US Nuclear Regulatory Commission licensed sources and Department of the Army commodities that incorporate curie and millicurie quantities of hydrogen-3, carbon-14, chlorine-36, cobalt-60, nickel-63, cesium-137, barium-137m, promethium-147, radium-226, and americium-241. Responsible for the disposition of local radioactive waste, transportation of radioactive materials, calibration, and dosimetry programs, instrument and source inventories and environmental surveillance. Develops laboratory procedures. Conducts routine health physics surveys and leak tests. Develops laboratory procedures. Generates technical reports and studies. Tests and evaluates Department of the Army commodities for product assurance. Prepares and monitors US Nuclear Regulatory Commission license application and requirements.

c. Training: The creation and development of the following health physics safety and radiation protection courses were completed by Mr. Funkhouser as tasked by Headquarters, US Army Materiel Command. These courses were contracted and presented at US Army Belvoir Research, Development, and Engineering Center. Each course lasted 40 hours. Classes were attended by about 25 students representing both US Army Materiel Command installations and activities as well as personnel from the Department of Navy and National Institute of Standards and Technology, formally the National Bureau of Standards. Mr. Funkhouser completed the following courses:

(1) 'Radiological Emergency Response Training Course,' 09-13 Jan 84, Radiation Management Corporation.

(2) 'Depleted Uranium Radiation Safety Course,' 5-9 Mar 84, Battelle Pacific Northwest Laboratories.

(3) 'Occupational Radiation Protection Course,' 09-20 Jul 84, Don Stone and Associates.

(4) 'Transportation of Radioactive Material by Highway Carrier and US Postal Service,' 14-18 Jan 85, Afftrix, Ltd..

(5) 'Radioactive Waste Management and Disposal of Nuclear Materials,' 15-19 Apr 85, Afftrix, Ltd..

(6) 'Health Physics and Laboratory Instrumentation Course,' 19-23 May 86, General Health Physics.

(7) 'Industrial X-ray and Gamma Radiation Protection Course,' 19-22 Aug 86, Done Stone and Associates.

(8) 'Health Physics and Laboratory Instrumentation Course,' 19-23 May 86, General Health Physics.

(9) 'Environmental Radiation Monitoring,' 17-21 Nov 87, General Health Physics.

(10) 'Management of Radiation Accident and Emergency Preparedness Training Course,' 02-06 Mar 87, Battelle Pacific Northwest Laboratories.

(11) 'External Dosimetry and Measurement Course,' 09-13 Mar 87, Battelle Pacific Northwest Laboratories.

(12) 'Depleted Uranium Safety Course,' 16-20 Nov 87, Battelle Pacific Northwest Laboratories.

(13) 'Health Physics Instrumentation and Air Sampling,' 18-22 Apr 88, General Health Physics.

(14) 'Radiation Protection Program Internal Review Course,' 1-5 Aug 88, Don Stone and Associates.

2. RAMACHANDRA K. BHAT, Health Physicist, Alternate Radiation Protection Officer, Chief of the Radiation Research Division, (Materials, Fuels, and Lubricants Directorate), US Army Belvoir Research, Development, and Engineering Center, Fort Belvoir, Virginia.

a. Education:

(1) 1956-60, Bachelor of Science in Chemistry, University of Karnataka, Dharwar, India.

(2) 1960-62, Master of Science in Chemistry, University of Karnataka, Dharwar, India.

(3) 1962-63, Doctor of Philosophy in Chemistry, University of Karnataka, Dharwar, India.

b. Experience:

(1) 1963-75, Scientific Officer, Bhabha Atomic Research Center, India. Provided health physics support to the Atomic Fuels Division.

(2) 1975-79, Senior Chemist, M.G. Scientific Gases, Somerville, New Jersey. Provide health physics support and prepared mixed, calibrated radioactive gases for the Office of Production.

(3) 1980-82, Radiochemist, New Jersey State Bureau of Radiation Protection, Trenton, New Jersey. Member of the New Jersey Nuclear Emergency Response Team. Collected and analyzed data, and reported to the Director of the New Jersey Radiological Health Surveillance Program.

(4) 1982-82, Principal Scientist, NUS Radiological Laboratory, Pittsburgh, Pennsylvania. Developed and supervised an Ultra Modern Computerized Data Based Radiological Laboratory in support of the Nuclear Reactor Environmental Radiation Monitoring Program.

(5) 1982-Present, Health Physicist, Alternate Radiation Protection Officer, Vice chairman of the Belvoir Research, Development, and Engineering Center's Radiation Control Committee, Chief of the Radiation Research Division, (Materials, Fuels, and Lubricants Directorate), US Army Belvoir Research, Development, and Engineering Center, Fort Belvoir, Virginia. Supervises the creation and development of three annual health physics safety and radiation protection courses for worldwide participation by Department of Defense radiation protection personnel as directed by Headquarters, US Army Materiel Command. Supervises the creation and development of testing procedures for quality assurance of proposed Department of the Army commodities that incorporate radioactive material. Supervises the creation and development of the highly successful Radon Program for collecting and analyzing radon-222 in drinking water and radon-222 in air using both charcoal cannister and track etch technologies. Supervises the re-creation, validation, and demonstration of an imaging technique for detecting buried nonmetallic landmines using 250 kVp x-ray generator. Approves nearly 100 health physics and laboratory procedures for the safe use of radioactive materials. Successfully participates in the US Environmental Protection Agency's Laboratory Intercomparison and Cross Check Program and Environmental Protection Agency's Radon Measurement Proficiency Program.

c. Training: The creation and development of the following health physics safety and radiation protection courses were supervised by Dr. Bhat as tasked by Headquarters, US Army Materiel Command. These courses were contracted and presented at US Army Belvoir Research, Development, and Engineering Center. Each course lasted 40 hours. Class was attended by about 25 students representing both US Army Materiel Command installations and activities as well as personnel from the Department of Navy and National Institute of Standards and Technology, formally the National Bureau of Standards. Dr. Bhat completed the following courses:

(1) 'Radiological Emergency Response Training Course,' 09-13 Jan 84, Battelle Pacific Northwest Laboratories.

(2) 'Depleted Uranium Radiation Safety Course,' 5-9 Mar 84, Battelle Pacific Northwest Laboratories.

(3) 'Occupational Radiation Protection Course,' 09-20 Jul 84, Don Stone and Associates .

(4) 'Transportation of Radioactive Material by Highway Carrier and US Postal Service,' 14-18 Jan 85, Afitrex, Ltd..

(5) 'Radioactive Waste Management and Disposal of Nuclear Materials,' 15-19 Apr 85, Afitrex, Ltd..

(6) 'Health Physics Radiation Protection Course,' 22 Jul - 02 Aug 85, General Health Physics.

(7) 'Health Physics and Laboratory Instrumentation Course,' 19-23 May 86, General Health Physics.

(8) 'Industrial X-ray and Gamma Radiation Protection Course,' 19-22 Aug 86, Don Stone and Associates.

(9) 'Health Physics and Laboratory Instrumentation Course,' 19-23 May 86, General Health Physics.

(10) 'Environmental Radiation Monitoring,' 17-21 Nov 87, General Health Physics.

(11) 'Management of Radiation Accident and Emergency Preparedness Training Course,' 02-06 Mar 87, Battelle Pacific Northwest Laboratories.

(12) 'External Dosimetry and Measurement Course,' 09-13 Mar 87, Battelle Pacific Northwest Laboratories.

(13) 'Depleted Uranium Safety Course,' 16-20 Nov 87, Battelle Pacific Northwest Laboratories.

(14) 'Health Physics Instrumentation and Air Sampling,' 18-22 Apr 88, General Health Physics.

(15) 'Radiation Protection Program Internal review Course,' 1-5 Aug 88, Don Stone and Associates.

Item 8 - TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS

Training for individuals working in or frequenting restricted areas is described at Item 7 and Item 10 of this Application. Additional training is specifically written in US Army Belvoir Research, Development, and Engineering Center's Standing Operating Procedure Number 385-11, Safety: Radiation Protection Program, at Section I and Section II, Para 14, 15, 16, 17, 18, 19, 20, and 21.

Item 9 - FACILITIES AND EQUIPMENT

1. Radioisotope and Counting Lab, Bldg 363, Rm 107-109: Two fixed in place instruments are located in room 109. The alpha-beta counting system is calibrated with Environmental Protection Agency's reference filters impregnated with low level strontium-90/ytterium-90, cesium-137, and americium-241 of generally less than one nanocurie (37 Bq). Liquid scintillation counting system is calibrated with prepared low level quenched standards of generally less then one microcurie (37 kBq). Two forced ventilating hoods with Cambridge air filtering systems continually exhaust air from the rooms whenever US Army compasses, meters, or indicators are under evaluation for presence of radium-226. Low level standards are stored for use as prepared quenched standards, quality assurance, and quality control. Check sources are used with portable Geiger counters. In addition, low level US Army commodities and environmental samples may be stored for counting, identification, measurement of activity, or studies of general radioluminescence. In addition one or more portable air monitors, which are available for loan as required, are calibrated on site with calibrated tritiated gas to measure presence of airborne tritium. Floors, walls, ceiling, and benches are made of non-porous materials. Absorbant materials cover surfaces and trays, which collect spillage.

2. Gamma Spectroscopy Lab, Bldg 363, Rm 135: One fixed in place gamma spectrometer and multiple channel analyzer. Mixed solution of generally less than one nanocurie (37 Bq) of gamma emitters are used for calibration. In addition, low level US Army commodities and environmental samples may be stored for counting, identification, measurement of activity, including evaluation of cannisters for presence of radon-222. One forced ventilating hood continually exhausts air from the room whenever US Army compasses, meters, or indicators are under evaluation for presence of radium-226.

3. Environmental Radioactivity and Radioluminescent Lab, Bldg 363, Rm 134: One fixed in place liquid scintillation counting system is calibrated with prepared low level quenched standards of generally less then one microcurie (37 kBq). One forced ventilating hood continually exhausts air from the room whenever US Army compasses, meters, or indicators are under evaluation for presence of radium-226. Low level standards are stored for use as prepared quenched standards, quality assurance, and quality control. Check sources are used with portable Geiger counters. In addition, low level US Army commodities and environmental samples may be stored for counting, identification, measurement of activity, or studies of general radioluminescence.

4. Storage Facility:

a. The radiation storage vault, Bldg 304, and the radiation storage room, Bldg 363C, US Army Belvoir Research, Development, and Engineering Center, Fort Belvoir, Virginia, are designed for long term storage sites for unused or unwanted radioactive material. The vault is covered with 18 inches of earth and constructed with 12 inches of reinforced concrete walls with high grade steel door and security lock. The vault is about 120 square feet with 33 storage tubes recessed into the concrete wall. Each tube is 6 inches in diameter and 39 inches long. The tubes are set in high density poured concrete. The vault include 4 storage pits. Each pit is 24 inches in diameter and 48 inches deep. Each pit is set inside reinforced concrete floor. Additional repositories may include lead and steel pigs from 1 inch to 6 inches in diameter, heavy duty plastic bags, and several 55-gallon, steel grade drums suitable for storage or transportation as required.

b. The radiation storage room, Bldg 363C, is also designed for long term storage of unused or unwanted radioactive material. The room about 95 square feet with concrete floor and walls. Unwanted sources of americium-241 are stored in flame proof cabinets.

Item 10 - RADIATION SAFETY PROGRAM

Subitem 10.1 - Personnel Monitoring Equipment

1. Beta, gamma, and neutron sensitive film badges and/or thermoluminescent dosimeters are supplied and evaluated monthly by US Army Ionizing Radiation Dosimetry Center (IRDC), Lexington, Kentucky. Film badges are exchanged at monthly intervals. Evaluation of employee's film badges is completed by IRDC and measurements of dose equivalent are returned on 'Photodosimetry Report, Exposure to Ionizing Radiation.' Data is transferred to DD Form 1141, 'Record of Occupational Exposure to Ionizing Radiation.'

2. Bioassays for tritium are routinely performed monthly. Specimens are sent to US Army Environmental Hygiene Agency for evaluation. Data are returned on Standard Form 557 (NSN 7540-00-181-8344).

3. Historical records to date document dose equivalent to Radiation Workers under this license at less than 1 percent of the limits specified at 10 CFR 20.202 and less than 10 per cent of the limits specified at US Army Belvoir Research, Development, and Engineering Center's Standing Operating Procedure Number 385-11, Section II, Para 19(e), ALARA.

Item 10 - RADIATION SAFETY PROGRAM

Subitem 10.2 - Radiation Detection and Instrument Calibration

	Type	Number Available	Radiation Detected	Sensitivity Range	Use
1.	Non-portable counters:				
A.	Gamma spectrometer Canberra Series 10 & 90	2	Gamma	6,000,000 cts	Quantitative analysis
B.	Gas flow proportional Tennelec	1	Alpha-beta	1,000,000 cts	Quantitative analysis
C.	Liquid scintillation Beckman & LKB	2	Alpha-beta	100,000 cts	Quantitative analysis
2.	Portable flux meters:				
A.	Nuclear Chicago	1	f-neutron	0-25 n/cm^2/s	Survey and monitor
	Mdl 2646, S/N 0110	1	t-neutron	0-25 kn/cm^2/s	Survey and monitor
	Mdl 2673, S/N 0116				
3.	Portable gas flow proportional counters:				
A.	Eberline, alpha counter Mdl PAC-4G-3, S/N 4073 4083	2	Alpha	0-500 kcpm	Survey and monitor
4.	Portable Geiger counters:				
A.	AN/PDR 27(J) Mdl S/N 4053	1	Beta-gamma	0-500 mr/h	Survey and monitor
B.	Eberline	4	Beta-gamma	0-50 mr/h 0-70 kcpm	Survey and monitor
	Mdl E-120, S/N 1411 7139 7140 7141 7071				
C.	Eberline	2	Beta-gamma	0-2,000 mr/h	Survey and monitor
	Mdl E-500B, S/N 0454 1155				
D.	Eberline	1	Beta-gamma	0- 2,000 mr/h 0-28,000 cpm	Survey and monitor
	Mdl E-520, S/N 0115				
E.	Eberline (ESP)	1	Beta-gamma	0- 3,000 mr/h	Survey and monitor
	Mdl HP-270, S/N 0294				
F.	Eberline (Teletector)	2	Beta-gamma	0- 1,000 r/h	Survey and monitor
	Mdl 6112, S/N 45069 45136				

G.	Ludlum Mdl 3,	S/N 2155 2159	2	Beta-gamma	0-150 mr/h	Survey and monitor
H.	Ludlum Mdl 12S,	S/N 50418	1	Beta-gamma	0-3,000 ur/h	Survey and monitor

5. Portable ion chambers:

A.	Eberline Mdl RO-3,	S/N 0521 0522	2	Beta-gamma	0-5,000 mr/h	Survey and monitor
B.	Johnston Mdl 955B,	S/N FF 1007 FF 1099	2	Tritium Carbon-14 Gamma	10,000 uCi/m^3 1,500 uCi/m^3 50,000 ur/h	Air monitor
C.	Reuter Stokes Mdl RS-111,	S/N 4041 4042	2	Gamma	0-500 ur/h	Air monitor
D.	Victoreen Mdl 440 RF/D,	S/N 0181	1	Xray-gamma	0-100 mr/h	Survey and monitor
E.	Victoreen, Cutie Pie Mdl 740-F,	S/N 0402	1	Beta-gamma	0-25,000 mr/h	Survey and Monitor
F.	Victoreen, Cutie Pie Mdl 740-G,	S/N 0413	1	Beta-gamma	0-100,000 mr/h	Survey and monitor
G.	Victoreen, R-meter Mdl 570,	S/N 1158	1	Beta-gamma	0-100 r	Survey and Monitor

6. Portable scintillation counters:

A.	Eberline, alpha counter Mdl PAC-4S,	S/N 2434	1	Alpha	0-2 Mcpm	Survey and monitor

Item 10 - RADIATION SAFETY PROGRAM

Subitem 10.3 - Operating and Emergency Procedures

1. On site calibration of radiation detecting equipment is limited to non-portable gas flow proportional counters, liquid scintillation counters, and gamma spectrometers on local inventory. All portable radiation detecting equipment including flux meters, gas flow proportional counters, Geiger counters, ion chambers, and scintillation counters are sent as required to Department of the Army installations which are authorized to perform required calibration.

2. Calibration of non-portable radiation detecting equipment and use of check sources with calibrated portable radiation detecting equipment are detailed in numerous locally written laboratory procedures, which are supplemented with manufacture's manuals and service contracts.

3. Laboratory rooms, check sources, and Department of the Army devices, gauges, indicators, and meters that incorporate NRC licensed material are surveyed monthly, quarterly, or semiannually as required.

4. Leak testing services are limited to local inventories and packages for transport in accordance with Title 49, Code of Federal Regulations, Part 173.443 as required. Methods are detailed in locally written laboratory procedures.

5. All files on radiation protection surveys, training, standing operating procedures, laboratory procedures, analyses, inventories and accounting, dosimetry, radiation control committee, inspections, reports, and facilities are documented in accordance with AR 25-400-2, The Modern Army Recordkeeping System.

6. A detailed radiation safety program including emergency response, dosimetry, written laboratory procedures, training, ALARA, and organization is forwarded at Encl 1, US Army Belvoir Research, Development, and Engineering Center's Standing Operation Procedure Number 385-11, Safety: Radiation Protection Program. A detailed US Army Belvoir Research, Development, and Engineering Center's Environmental Report is also forwarded at Encl 2.

7. In addition individuals who routinely work in restricted areas under this License create and participate in Headquarters, US Army Materiel Command tasked classes in radiation accident and emergency preparedness. Course, syllabus, and Statement of Work are prepared in accordance with Item 7 of this Application. Instruction is presented by qualified professionals as detailed in Item 7, 1c(1), 1c(2), and 1c(10), and Item 7, 2c(1), 2c(2), and 2c(10) of this Application. 'Management of radiation Accident and Emergency Preparedness Training Course' will be presented by Scinta, Inc. 5-9 Jun 89.

Item 11 - WASTE MANAGEMENT

1. Unwanted radioactive materials will be secured in Bldg 363, a rad storage vault and Bldg 363C, a rad storage room, at US Army Belvoir Research, Development, and Engineering Center, Fort Belvoir, Virginia.

2. Advanced instructions will be secured from US Army Armament, Munitions, and Chemical Command (AMCCOM), Rock Island Illinois, in accordance with AMCCOM Pamphlet 385-1, Safety: Handbook for Disposal of Radioactive Waste in Accordance with US Army Guidelines, before local preparation and transport of unwanted radioactive material to authorized facility.

3. Advanced instructions will be secured from manufactures of devices that incorporated licensed materials before local preparation and transport of unwanted devices to authorized facility.

4. Radioactive gases or suspended aerosols will be discharged to the atmosphere through forced ventilating hoods in concentrations not exceeding standards at Title 10, Code of Federal Regulations, Part 20.

5. Radioactive solutions will be diluted before sanitary discharge in concentrations not exceeding standards at Title 10, Code of Federal Regulations, Part 20.

DEPARTMENT OF THE ARMY
US ARMY BELVOIR RESEARCH, DEVELOPMENT, AND ENGINEERING CENTER
FORT BELVOIR, VIRGINIA 22060-5606

STANDING OPERATING PROCEDURE
NUMBER 385-11*

JUL 26 1988

SAFETY

Radiation Protection Program
(RF, Microwave, Laser, X-Ray, and Radionuclide)

* Supersedes BELVOIR R&D Center Regulation 385-11, dated 6 March 1984.

STANDING OPERATING PROCEDURE
NUMBER 385-11

JUL 26 1988

SECTION I

IONIZING RADIATION PROTECTION PROGRAM

1. Purpose. This SOP establishes the US Army Belvoir RD&E Center (Center) Radiation Protection Program and the Center's Radiation Control Committee (RCC). It outlines the duties and responsibilities of the Center's Radiation Protection Officer (RPO), the Center's Laser Safety Officer (LSO), the Center's Radiation Research Group (RRG), and RADIATION WORKERS. It describes safety practices for all individuals authorized to receive, procure, use, possess, store, transport, or dispose of High Intensity NONIONIZING and IONIZING SOURCES (HIN&IS) of RADIATION. (See Para 21 for terms and definitions as indicated in capital letters).

2. Scope.

a. This regulation applies to all military and civilian personnel assigned duties at US Army Belvoir RD&E Center and US Army Center for Night Vision and Electro-Optics (CNVEO) under Interservice Support Agreement, who receive, use, store, transport, or dispose of HIN&IS of RADIATION.

b. Microwave ovens at the Center and CNVEO are inventoried and surveyed by HSXA-PVM (Preventive Medicine) as required.

c. High intensity optical or ultraviolet sources of nonionizing radiation or ultrasound from searchlights, carbon arcs, electric arcs, welding, diathermy, or non-lasers at the Center and CNVEO are inventoried and surveyed by STRBE-Q (Safety, Health, and Environmental Office) as required.

3. Policy.

a. HIN&IS of RADIATION shall be utilized toward the accomplishment of assigned research, testing, evaluation, and development of missions and directives.

b. Construction of Radiation Facilities must be coordinated with AMC FSA and approved by HQ AMC, IAW AMC-R 385-100, Para 5-29.

c. Transfer of radioactive commodities in the DOD Supply System can't be transferred to the US Army Defense Reutilization and Marketing Offices. Items of property must be checked against listings in TB 43-0116.

6. Dosimetry.

a. Each RADIATION WORKER shall wear a personal primary whole-body film badge upon entering a controlled RADIATION AREA. Film badges shall be worn between the shoulders and the hips and securely attached to a garment. Additional film badges can be promptly obtained from the RPO. DO NOT exchange or borrow unassigned film badges. Promptly report all suspected personal film badge exposures. Secure film badges at designated control sites upon leaving controlled radiation areas.

b. Auxiliary wrist-film badge may be worn to measure localized exposure as required. Finger badges, pocket chambers, or thermoluminescent dosimeter may also be worn as appropriate to specified radiological fields.

c. All dosimeters are controlled, issued, and processed periodically for evaluation by the RPO.

d. RADIATION WORKERS will report lost film badge to the RPO for immediate replacement.

STANDING OPERATING PROCEDURE
NUMBER 385-11

JUL 26 1988

SECTION I

IONIZING RADIATION PROTECTION PROGRAM

1. Purpose. This SOP establishes the US Army Belvoir RD&E Center (Center) Radiation Protection Program and the Center's Radiation Control Committee (RCC). It outlines the duties and responsibilities of the Center's Radiation Protection Officer (RPO), the Center's Laser Safety Officer (LSO), the Center's Radiation Research Group (RRG), and RADIATION WORKERS. It describes safety practices for all individuals authorized to receive, procure, use, possess, store, transport, or dispose of High Intensity NONIONIZING and IONIZING SOURCES (HIN&IS) of RADIATION. (See Para 21 for terms and definitions as indicated in capital letters).

2. Scope.

a. This regulation applies to all military and civilian personnel assigned duties at US Army Belvoir RD&E Center and US Army Center for Night Vision and Electro-Optics (CNVEO) under Interservice Support Agreement, who receive, use, store, transport, or dispose of HIN&IS of RADIATION.

b. Microwave ovens at the Center and CNVEO are inventoried and surveyed by HSXA-PVM (Preventive Medicine) as required.

c. High intensity optical or ultraviolet sources of nonionizing radiation or ultrasound from searchlights, carbon arcs, electric arcs, welding, diathermy, or non-lasers at the Center and CNVEO are inventoried and surveyed by STRBE-Q (Safety, Health, and Environmental Office) as required.

3. Policy.

a. HIN&IS of RADIATION shall be utilized toward the accomplishment of assigned research, testing, evaluation, and development of missions and directives.

b. Construction of Radiation Facilities must be coordinated with AMC FSA and approved by HQ AMC, IAW AMC-R 385-100, Para 5-29.

c. Transfer of radioactive commodities in the DOD Supply System can't be transferred to the US Army Defense Reutilization and Marketing Offices. Items of property must be checked against listings in TB 43-0116.

d. The following radiological standards are applicable to this SOP. Protracted exposure to high intensity ionizing radiation may inflict an acute or chronic radiological injury or adverse HEMATOPOIETIC response which can be life-threatening. Therefore, all personal exposures to radiations shall be reduced and maintained at levels that are as low as reasonably achievable (ALARA). Personal exposure to ionizing radiation shall not exceed those QUANTITIES as specified in the ionizing radiological protection standards and promulgated at:

(1) Title 10, "Code of Federal Regulation" (10 CFR),

(2) AR 40-5, "Medical Services: Preventive Medicine,"

(3) AR 40-14, "Medical Services: Control and Recording Procedures for Exposure to Ionizing Radiation and Radioactive Materials."

e. These regulatory standards follow the recommendations of the following acknowledged national and international authorities on radiological protection:

(1) American National Standards Institute (ANSI),

(2) International Atomic Energy Agency (IAEA),

(3) International Commission on Radiation Units (ICRU) and Measurements,

(4) International Commission on Radiological Protection (ICRP),

(5) National Center for Devices and Radiological Health (NCDR),

(6) National Council (Committee) on Radiation Protection (NCRP) and Measurements.

f. A radiological accident or incident shall be reported to the RPO and the Chairman of the RCC IAW 10 CFR, AR 385-11, and AR 385-40.

4. Medical. RADIATION WORKERS shall complete a job-related physical examination IAW AR 40-5 and AR 40-14.

5. Accident Report. In the event of an accident, the supervisor will make an immediate telephonic report to the RPO and the chairman of the RCC IAW Para 11 of this SOP. Supervisors will investigate and forward accident report IAW Belvoir RD&E Center SOP 385-3 to the Safety, Health, and Environmental Office within two working days. Employees will report to their supervisors, without delay, any injuries sustained in the performance of their duties. They will visit the Occupational Health Physician or Emergence Treatment Room, US Dewitt Army Hospital, Before taking leave from their work as a result of an injury.

6. Dosimetry.

a. Each RADIATION WORKER shall wear a personal primary whole-body film badge upon entering a controlled RADIATION AREA. Film badges shall be worn between the shoulders and the hips and securely attached to a garment. Additional film badges can be promptly obtained from the RPO. DO NOT exchange or borrow unassigned film badges. Promptly report all suspected personal film badge exposures. Secure film badges at designated control sites upon leaving controlled radiation areas.

b. Auxiliary wrist-film badge may be worn to measure localized exposure as required. Finger badges, pocket chambers, or thermoluminescent dosimeter may also be worn as appropriate to specified radiological fields.

c. All dosimeters are controlled, issued, and processed periodically for evaluation by the RPO.

d. RADIATION WORKERS will report lost film badge to the RPO for immediate replacement.

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Section II

RESPONSIBILITIES

7. Commanding Officer, Belvoir RD&E Center. The Commander formally authorizes the following Radiation Protection Program:

a. A formal written Radiation Protection Program. This program will incorporate pertinent rules and regulations ensuring safe and productive utilization of HIN&IS of radiation necessary to accomplish mission goals and command directives.

b. Exercise compliance with all Federal, DA, State, and local rules and regulations. In particular, the following provisions shall be vigorously enforced:

(1) 10 CFR 19, "Notices, Instructions, and Reports to Workers, Inspections,"

(2) 10 CFR 20, "Standards for Protection Against Radiation,"

(3) 10 CFR 21, "Reporting of Defects and Noncompliance."

c. Appoint in writing the RPO and the alternate RPO. (Does not denote commissioned status.)

d. Appoint in writing the Laser Safety Officer (LSO) and Laser Range Safety Officer (LRSO) as required. (Does not denote commissioned status.)

e. Create the RCC and appoint in writing qualified members to the RCC. Membership to the RCC will consist of the following personnel.

(1) Chairman: Representative of the Commanding Officer, Belvoir RD&E Center.

(2) Vice Chairman: Chief, RRG.

(3) Action Officer: RPO.

(4) Secretary: Representative from the RRG,

(5) Member: Alternate RPOs; representative(s) each from the Safety, Health, and Environmental Office, MEDDAC, FESA, and CNVEO,

(6) Co-member: Representative(s) from tenant organization; Fort Belvoir, Virginia, as appointed in writing,

(7) Guest: Invited representatives from the Federal Government or tenant organization on official business.

f. Authorize application or renewal of required Nuclear Regulatory Commission (NRC) material licenses and Department of the Army Radiation Material Authorizations (DARMA) or permits.

8. Director, CNVEO. Under the Interservice Support Agreement, the Center's RPO/LSO may serve as CNVEO's RPO/LSO. This SOP applies to all military and civilian personnel assigned duties at the CNVEO who procure, receive, use, store, transport, or dispose of HIN&IS of radiation. The RPO shall obtain required NRC specific licenses and DARMAs or permits toward accomplishment of CNVEO mission directives. The RPO shall exercise all requirements as specified in this SOP and applicable DA regulations, DARMAs or permits, or NRC specific license requirements.

9. Chief, Supply and Property Accounting Division. The Chief of Supply and Property Accounting Division will promptly inform the RPO (45437/5133), within 3 hours upon receipt of radioactive commodities in the DoD supply system. Radioactive commodities are described in shipping papers, Government Bill of Lading, markings, or labels. Following a radiological survey, the RPO will deliver radioactive commodity to the principal user.

10. Chief, Safety Health and Environmental Office. The Chief of the Safety Health and Environmental Office will inform and advise the RPO/LSO of general issues of health and safety that may impact on the local Radiation Protection Program.

11. The Center's Radiation Control Committee (RCC). The RCC will perform the following functions:

a. Inform the Commander of relevant Federal, DA, AMC, and NRC rules and regulations which impact on the Commander's directives.

b. Advise the Commander of current radiological health and safety issues and their impact on the requirements of the mission and command directives.

c. Call the Commander's attention to quarterly meetings of the RCC by DF to the Technical Director from the RPO.

d. Conduct routine business with the Commander and the membership of the RCC by DFs.

e. Document attendance, expedite matters of concern, resolve conflicts, discuss and approve/disapprove proposed actions, and recommendation as appropriate.

f. Prepare and forward minutes of the RCC to the Commander and membership.

g. Coordinate administrative issues among the membership of the RCC.

h. Set safety recommendations and guidelines at local labs, sites, and facilities that procure, receive, use, possess, store, transport, or dispose of HIN&IS of radiation.

i. Discuss and resolve conflicts between regulatory requirements and Commander's directives.

j. Review and comment on applications and amendments to NRC specific license and DA radiation authorization.

k. Delegate authority to the RRG which shall perform each and all duties and functions commensurate with Federal, State, DA, AMC, DOT, NRC, and local rules and SOPs for procurement, receipt, use, storage, transfer, and disposal of HIN&IS of radiation.

12. The Center's Radiation Protection Officer (RPO). The RPO is a member of the RRG; Material, Fuels, and Lubricants Directorate, Building 363; Fort Belvoir, Virginia. The RPO will exercise the following functions:

a. Advise the Commander of current radiological issues of health and safety that impact on the requirements of the mission and directives of the Commander through the RCC.

b. Authorize the suspension of potentially hazardous proceedings and workmanship with HIN&IS of RADIATION pending recommendations of the RCC.

c. Serve on the RCC as Action Officer. Under the Interservice Agreement, the Center's RPO/LSO also serve as CNVEO's RPO.

d. Promote and extend local radiological protection services limiting potentially hazardous exposures to high intensity microwave, optical, laser, and ionizing sources of radiation at the CNVEO under the Interservice Support Agreement.

e. Member US Army Engineer and Fort Belvoir RCC.

13. The Center's Radiation Research Group (RRG). The RRG will execute the following functions under the authority of the Commanding Officer, the RCC, and the Chief of the RRG.

a. Enforce radiological rules and regulations as promulgated by Federal, State, DA, AMC, DOT, NRC, and local authorities.

b. Execute recommendations of the RCC.

c. Advise, assist, and instruct the Commander, supervisors, project managers, RADIATION WORKERS, and authorized personnel on relevant radiological issues that impact on health and safety.

d. Prepare documents, coordinate agreements, compose amendments, and submit timely application for renewal of NRC specific license and DARMA.

e. Schedule periodic radiological safety orientation; develop training materials; and instruct RADIATION WORKERS and authorized personnel upon assignment to RADIATION AREAS.

f. Perform and document routine microwave, radiofrequency, laser, DA, or NRC radiological survey and inspection at local sites and facilities where HIN&IS of radiation are stored and utilized IAW DA, AMC, NRC, regulations and local SOPs.

g. Verify completion of required medical examination of RADIATION WORKERS IAW AR 40-5, AR 40-14, AR 40-46, TB MED 524, and TB MED 523.

h. Conduct a biannual inventory of local HIN&IS of RADIATION.

i. Maintain current DD Form 1141, "Record of Occupational Exposure to Ionizing Radiation."

j. Provide personal monitoring devices and radiological protection services for RADIATION WORKERS.

k. Monitor shipments and packages incorporating radionuclides; verify pertinent DA, NRC, and DOT requirements.

l. Procure, operate, and maintain radiological detection and electronic equipment; calibrate survey instruments as required.

m. Perform radiological decontamination functions as required; seek competent assistance as needed.

n. Review SOPs for accuracy and completeness.

o. Post relevant DA, AMC, NRC, DOT documentation and local SOPs as required. Retain complete DA radiation authorization, NRC specific licenses, and their supporting documentation at the office of the Radiation Research Group, Room 136, Building 363. Inspection of authorized documentation is invited.

p. Receive and prepare local radiological wastes for storage and disposal.

q. Conduct radiological testing and evaluation of DA commodities as directed; record data and supply documentation and recommendations.

r. Monitor environmental background radiation and radionuclides released into the environment; prepare documentation and submit Environmental Reports as required.

s. Study prescribed technical documents, tests, and analyses; report radiological health implications to HQ, AMC and AMC MSCs as required.

t. Write and forward minutes of the RCC to the Commander and membership.

u. Write technical procedures for inclusion in military specifications and technical bulletins as required.

v. Manage and utilize the RRG's Technical Library; obtain pertinent Federal regulations, national and international publications, and texts of health physics and radiological protection, subscribe to related technical journals and publications, and procure texts, brochures, pamphlets, films, slides, and educational paraphernalia as needed.

w. Monitor all shipments of radioactive materials within 3 hours upon receipt at Building 335. Rates of DOSE EQUIVALENT greater than 10 mrem/hr at 3 feet or 200 mrem/hr on contact or removable radioactive contamination in excess of 22,000 dpm (0.01 microcurie) per 100 square centimeters of package requires regulatory response IAW 10 CFR 20.205.

14. Supervisors. The Center's and CNVEO's supervisors of Ionizing RADIATION WORKERS assigned duties in RADIATION AREAS will execute the following functions:

a. Prepare an SOP outlining procedures that limit exposure to quantities of IONIZING RADIATION that is "as low as reasonably achievable" (ALARA). Post copies of SOP and forward copy to the RPO. Enforce safety procedures as outlined in SOP.

b. Instruct RADIATION WORKERS and demonstrate proper use of radiological devices, materials, commodities, or sources of IONIZING RADIATION.

c. Observe posted radiological signs and labels of warning, caution, or danger. Read posted notices and documents:

(1) NRC Form 3,"Notices to Employees,"

(2) Statement: "Energy Reorganization Act," P.L. 93-438, Sec. 206,

(3) DF, STRBE-VR, undated, subject: "Title 10 CFR 21, Reporting of Defects and Noncompliance,"

(4) "Procedures for Identifying Items to be Reported to NRC under 10 CFR 21,"

(5) "Notice to Workers": Copies of NRC License A45-00953-01, and DA Authorization A45-95-03, NRC Rules and Regulations, 10 CFR and 10 CFR 19, 20, and 21 can be examined at the Material, Fuels, and Lubricants Laboratory; Building 363, Room 136; Chief, Radiation Research Group, 45437/5133.

(6) Belvoir RD&E Center SOP No. 385-11: Safety: Radiation Protection Program (RF, Microwave, Laser, X-ray, and Radionuclide),

(7) SOPs.

d. Maintain current inventory and location of Ionizing RADIATION SOURCES. Secure them against unauthorized use.

e. Report abnormal operating parameters or radiological exposures to the RPO. Secure maintenance and radiological survey before resumption of normal operating procedures.

f. Assist RPO and investigate suspected injuries or unusual exposures to IONIZING RADIATION in excess of 10% of the REGULATORY STANDARDS. Supply documentation, contact medical authorities, report fire to the fire department.

g. Prohibit eating, drinking, pipetting, chewing, smoking, and application of cosmetics in RADIATION AREAS.

h. Separate and identify contaminated laboratory refuse by radionuclide and activity.

i. Transfer all unwanted DA/NRC licensed radionuclides to the radiological storage vault, Building 304. (The RPO will assist transfer.)

15. Standing Operating Procedures (SOPs).

a. The following suggested outline should be developed IAW the severity of the radiological hazards associated with analysis, application, calibration, development, dosimetry, evaluation, gauging, quality assurance, quality control, research, survey, testing, transportation, storage, or disposal of ionizing RADIATION SOURCES:

(1) References,

(2) Discussion,

(3) Purpose,

(4) Equipment,

(5) Theory,

(6) Procedure.

b. The following references can provide significant information that can supplement required SOPs:

(1) AMCR 385-25, "Safety: Radiation Protection,"

(2) ANSI Standards,

(3) NCDR Publications,

(4) DA Technical Bulletins,

(5) DA Technical Manuals,

(6) IAEA Safety Series.

(7) ICRP Publications,

(8) ICRU Reports,

(9) NBS Handbooks,

(10) NCRP Reports.

16. The Center's and CNVEO's Ionizing RADIATION WORKERS. RADIATION WORKERS assigned duties at RADIATION AREAS will complete the following administrative and regulatory requirements:

a. Complete job related physical examination IAW Para 4,

b. Receive personal monitor - film badge or thermoluminescent dosimeter - from the RPO and secure its use IAW Para 6,

c. Observe requirements at Para 6 & 14,

d. Report abnormal operating parameters or radiological exposures to the supervisor,

e. Report lost or misplaced film badge and secure replacement from RPO,

f. Avoid eating, drinking, pipetting, chewing, smoking, and application of cosmetics in RADIATION AREAS and avoid cross contamination,

g. Identify contaminated laboratory refuse by radionuclide and activity,

h. Will NOT attempt unauthorized repair, dismemberment, transfer, or disposal of an ionizing source of radiation,

i. Wear protective apparel, gloves, shoe covers, or respirator as prescribed by local SOP,

j. Utilize exhaust hoods, vents, traps, vacuum chambers, or glove boxes whenever radiological gases, fluids, aerosols, grindings, or unsealed sources are manipulated,

k. Continually monitor hands, shoes, and apparel. Wash hands thoroughly following contact with radionuclide,

l. Leave RADIATION AREA if skin is broken, cut, or scraped and notify RPO,

m. Keep work surfaces neat, clean, and free of extraneous objects and equipment, cover surfaces with absorbent material,

n. Use trays or pans to limit and collect spillage,

o. Minimize radiological exposure that is ALARA IAW Para 19,

p. Notify the RPO upon indication of pregnancy.

17. Employee's Exposures. All personal exposures to IONIZING RADIATION shall not exceed those QUANTITIES AND LIMITS as specified by 10 CFR 20, "Standards for Protection Against Radiation," and AR 40-14. To insure that documented quantities of ABSORBED DOSE are "as low as reasonably achievable" (ALARA), RADIATION WORKERS entering a controlled RADIATION AREA shall wear a personal dosimeter as specified by the RPO. Personal exposures shall be documented on DA Form 3484 "Photodosimetry Report - Exposure to Ionizing Radiation," and DD Form 1141, "Record of Occupational Exposure to Ionizing Radiation." Personal reports are available upon request to the RPO IAW 10 CFR 19, "Notices, Instructions, and Reports to Workers; Inspections."

18. Training.

a. Anyone entering a controlled RADIATION AREA shall be informed of the presents of IONIZING RADIATION, RADIATION SOURCES, radiological hazards, exposure levels, precautions, safety tools and techniques, reporting responsibilities, and emergency response commensurate with the severity of the particular radiological hazard.

b. Each proposed RADIATION WORKER shall complete a "Radiological Orientation, Training, and Protection Review" as instructed by the RPO or alternate RPO. Each applicant shall be informed of the following relevant requirements from NRC rules and regulations at 10 CFR:

(1) 10 CFR 19, "Notices, Instructions, and Reports to Workers; Inspections."

(2) 10 CFR 20, "Standards for Protection Against Radiation."

(3) 10 CFR 21, "Reporting of Defects and Noncompliance."

(4) AR 40-14.

c. More comprehensive instruction and training shall be provided to RADIATION WORKERS, supervisors, and chiefs as requested. Instruction shall be commensurate with the severity of the radiological hazards and level of responsibility. Instructions shall include: fundamentals of radiation, radiological protection, ALARA, measurements (dosimetry, instrumentation, survey, mathematics), biological effects, and emergency response.

19. ALARA. This SOP constitutes the Center's and CNVEO's ALARA Program:

a. Personal exposure to IONIZING RADIATION shall be "as low as reasonably achievable" (ALARA). Administrative attention, engineering controls, and personal attention to the principles of radiological protection are essential means that minimize individual exposure to IONIZING RADIATION. Work promptly, use shielding, and maximize your distance from a source of IONIZING RADIATION will minimize ABSORBED DOSE that is ALARA. These principles are universally applicable.

b. Prompt completion of assign duties in RADIATION AREAS minimize ABSORBED DOSE. Isolation of IONIZING RADIATION in storage containers or repositories, walled enclosures or rooms, or incorporation as a sealed source or commodity, not only shields the source, but also maximizes distances between the individual and the isolated source.

c. Manipulating point sources of radiation with extendable tools and maintaining arm's length between a source and one's abdominal-chest can reduce ABSORBED DOSE from IONIZING RADIATION by several orders of magnitude. Even the air, wearing apparel, and skin can function as significant shielding from external radiological sources of IONIZING RADIATION or contamination. Dilution and physical decay of radionuclei can also significantly reduce EXPOSURE to IONIZING RADIATION.

d. The principles of ALARA shall be exercised upon use, survey, decontamination, and disposal of any radiological source. Because of the extreme range by 10 to 12 orders of magnitude of QUANTITIES that characterize sources of IONIZING RADIATION, relevant SOPs, technical bulletins, manuals, documents, and regulations must be consulted to optimize the principles of ALARA for each radiological source IAW Para 15.

e. An action level for review of SOPs and working conditions will be initiated should dosimetry report personal exposures to ionizing radiation in excess of 10% of Federal regulations. Any unusual changes in reported dosimetry of less than 10% will be similarly investigated.

f. Department of Defense Notice 6055.8 and NRC Regulatory Guide 8.10 are enforced at the Center and CNVEO.

20. Emergency Response.

a. Notify supervisors and the RPO upon loss of RADIOACTIVE MATERIAL, spillage of radioactive liquids, or release of radioactive gases. The RPO will coordinate emergency personnel. Areal restrictions, continuous air and personal monitoring, use of prescribed chemical decontamination, selection of shielding, apparel, respirators, and absorbents, washing techniques, effluent control, and disposal of contaminated materials shall be assessed IAW this section together with the nature and severity of the radiological incident.

b. Fires shall be reported to the fire department. Use of carbon dioxide fog shall be emphasized. Fog minimizes spread of contamination. Liquid effluents shall be monitored.

21. Definitions.

a. ABSORBED DOSE. The amount of energy imparted from an IONIZING RADIATION to a volume of irradiated tissue or matter divided by the mass of this volume. The gray is an SI unit of absorbed dose. One gray (Gy) equals one joule per kilogram. Also, one gray equals 100 rads where one rad equals 100 ergs per gram.

b. ACTIVITY. The number of nuclear transformations or transitions occurring in an amount of a radionuclide or in a radioactive material. The becquerel (Bq) is a SI unit of activity. One Bq equals 1 disintegration per second (dis/sec). One curie (Ci), a non-SI unit of activity, equals 37 billion becquerel.

c. ALARA. "As Low as Reasonably Achievable" is an NRC regulatory principle which limits exposure to IONIZING RADIATION as far below the regulatory limits at 10 CFR 20 as practicable.

d. DE MINIMIS. An EXPOSURE to a QUANTITY of IONIZING RADIATION whose calculated biological risk of genetic or somatic injury is a "trifle and of no regulatory interest." A calculated stochastic risk of one radiation-induced-cancer-fatality per million per lifetime (70 years) represents a proposed de minimis dose equivalent of 0.1 mrem per year.

e. DOSE EQUIVALENT. The amount of biologically significant dose. The sievert (Sv) is an SI unit of dose equivalent. One sievert is the product of the absorbed dose, quality factor, and distribution factor as assigned each type of IONIZING RADIATION. One sievert equals 100 rem of biologically significant dose equivalent. A quality factor of 1 rem per rad of absorbed dose is assigned x-ray, gamma radiation, and soft beta particles. A quality factor of 10 rem per rad of absorbed dose is assigned high energy neutrons, protons, or alphas. Heavy recoil nuclei are assigned a quality factor of 20 rem per rad of absorbed dose. Values assigned to quality factor can vary depending on the biological effect and the energy distribution of the IONIZING RADIATION. A unitless biological distribution factor of one has been recommended by the International Commission on Radiation Units and Measurements.

f. EXPOSURE. The amount of ionization or electric charge generated in air by x-ray or gamma radiation. The roentgen (R) is a special unit of exposure. One roentgen equals 258 microcoulombs per kilogram of air.

g. HEMATOPOIETIC. Biological system which includes the blood, blood-components, and blood forming organs. Those somatic cells and tissues which are especially radiosensitive to adverse effects from exposure to IONIZING RADIATION.

h. HIGH INTENSITY IONIZING AND NONIONIZING SOURCE (HIN&IS). A device or substance capable of generating potentially hazardous electromagnetic energy from radiofrequency, microwave, infrared, visible, ultraviolet, or ionizing alpha, beta, x-ray, or gamma radiation. See RADIATION SOURCE.

i. IONIZING RADIATION. Subatomic or electromagnetic radiation capable of generating atomic or molecular ions in air or tissue. Subatomic radiation includes alphas, betas, neutrons, recoil atoms, and electromagnetic radiation from x-rays or gamma radiation.

j. QUANTITIES. See ABSORBED DOSE, ACTIVITY, DOSE EQUIVALENT, EXPOSURE.

k. RADIATION. Transport of electromagnetic energy or subatomic particles at or near the speed of light. See IONIZING RADIATION this paragraph and NONIONIZING RADIATION at Para 34d.

l. RADIATION AREA. A controlled or restricted place that encloses a radiological field of IONIZING RADIATION whose rate of DOSE EQUIVALENT exceeds 5 millirems per hour (mrem/hr).

m. RADIATION SOURCE. Any material, commodity, equipment, device or substance which is capable of generating IONIZING RADIATION:

(1) Background:

(a) Cosmic showers (high energy electrons and muons),

(b) Indoor radon (Rn-222),

(c) Internal deposition (H-3, C-14, K-40, Rn-daughters),

(d) Terrestrial (H-3, C-14, K-40, Ra-226, Th-232, U-235, U-238).

(2) Electronically controlled x-ray system:

(a) Diffractometers,

(b) Electron beam epoxy, cutting, melting, welding,

(c) Electron microscopes,

(d) Fluoroscopes,

(e) Generators,

(f) Radiographs,

(g) Spectrographs.

(3) Radioactive commodity in the DoD supply system, TB 43-0116:

(a) Compasses (H-3, Pm-147, Ra-226),

(b) Depleted uranium (U-238),

(c) Gauges (Cs-137, Ra-226, Am-241),

(d) Meters (H-3, Ra-226),

(e) Signs (H-3).

(4) Radionuclides:

(a) Byproduct material (H-3, C-14, Co-60, Ni-63, Cs-137, etc.),

(b) Source material (thorium or uranium),

(c) Special nuclear material (U-233, U-235, Pu-239),

(d) Transuranic (Am-241, Cf-252, etc.).

(5) Unshielded generators, power supplies, rectifiers, transformers that operate above 10 kilovolts:

(a) Cathode ray tubes,

(b) Display monitors,

(c) Klystrons,

(d) Magnetrons,

(e) Televisions.

n. RADIATION WORKER. An individual who is occupationally exposed to IONIZING RADIATION or assigned duties in a controlled or restricted RADIATION AREA.

o. RADIOACTIVE MATERIAL. See IONIZING RADIATION and RADIATION SOURCE.

p. RADIONUCLIDE. Any substance that spontaneously disintegrates emitting IONIZING RADIATION. A substance uniquely characterized by its chemical symbol and mass number e.g. (Am-241).

q. REGULATORY STANDARDS. Federally imposed limits against exposure to ionizing radiation as promulgated at 10 CFR, 49 CFR, and AR 40-14.

SECTION III

THE NONIONIZING RADIATION PROTECTION PROGRAM

22. Purpose. This SOP establishes the US Army Belvoir RD&E Center (Center) US Army Center for Night Vision and Electro-Optics (CNVEO) Nonionizing Radiation Protection Program. It outlines the duties and responsibilities of the Center's or CNVEO's Laser Safety Officer (LSO), including Laser Workers, Team Leaders, Supervisors, and Directors of Laser Workers.

23. Scope.

a. This program extends to the Center's and CNVEO's organizations under Interagency Support Agreement - which procure, utilize, store, or dispose of lasers as well as high intensity microwave and radio frequency (R/F) sources of nonionizing radiation which is emitted in air at power densities IAW AEHA TG No. 153, "Guidelines for Controlling Potential Health Hazards from Radiofrequency Radiation."

b. Microwave ovens at the Center and CNVEO are inventoried and surveyed by HSXA-PVM (Preventive Medicine) as required.

c. High intensity optical or ultraviolet sources of nonionizing radiation or ultrasound from searchlights, carbon arcs, electric arcs, welding, diathermy, or non-lasers at the Center and CNVEO are inventoried and surveyed by STRBE-Q (Safety, Health, and Environmental Office) as required.

24. Policy.

a. Commercial, communication, educational, industrial, medical, military, and research lasers are classified potentially hazardous by the American National Standards Institute and the National Center for Devices and Radiological Health. Laser Safety is regulated under Title 21, Code of Federal Regulations, and changes are regularly published in the Federal Register. Prudent and reasonable application of administrative controls, engineering safeguards, medical surveillance, responsible conduct, and prompt response to unplanned nonionizing radiological incidents will expedite compliance with the DA rules and regulations that promote a safe and healthful working environment.

b. The following nonionizing radiological standards are applicable to this SOP.

(1) Protracted exposure to high intensity nonionizing LASER radiation may inflict serious skin-burn or adverse ocular impairment. Therefore, all personal exposures shall not exceed those quantities as specified in the nonionizing radiological protection standards as promulgated at:

(a) AR 40-46, "Medical Services: Control of Health Hazards from Lasers and Other High Intensity Optical Sources,"

(b) TB MED 524, "Occupational and Environmental Health: Control of Hazards to Health from Laser Radiation."

(2) Protracted exposure to high intensity nonionizing MICROWAVE or RADIOFREQUENCY (R/F) radiation can also inflict serious skin-burn, adverse lenticular opacities, or adverse physiological response. Therefore, all personal exposures shall not exceed those quantities as specified in the nonionizing radiological protection standards as promulgated at:

(a) AEHA TG No. 153, "Guidelines for Controlling Potential Health Hazards from Radiofrequency Radiation,"

(b) TB MED 523, "Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound."

25. Medical.

a. Laser Workers shall complete a job-related physical examination IAW AR 385-29, AR 40-46, and TB MED 524.

b. Microwave Workers shall complete a job related physical examination IAW AR 40-5 and TB MED 523.

26. Emergency. Life-threatening incidents shall be reported immediately to the Occupational Health Clinic (42550) for emergency first aid. Nonionizing radiological accident or incident shall be reported to the LSO, the CNVEO Ad Hoc Safety Committee and the Chairman of the RCC IAW AR 385-29, and AR 385-40.

27. Laser Hazard Classification (LHC).

a. The LHC is an alpha-numeric scale applied to each manufactured laser. Each class denotes a relative degree of hazard associated with inadvertent or careless exposure to laser radiation. The principal biological hazard is a measured retinal or corneal lesion, charring of skin, or destruction of sensitive ocular tissues following direct, diffuse, or specular reflected exposure to intense coherent laser radiation. Each LHC further connotes a level of managerial control designed to alert investigators and casual observers of serious biological and remedial consequences following careless attention to pertinent safety precautions. The LHC assigned to each laser depends upon the laser's wavelength, pulse mode, period of exposure, and magnitude of irradiation.

b. The protection standards applied to each LHC include well defined maximum permissible exposures. These values and quantities are listed at:

(1) AMC-R 385-29, "Safety: Laser Safety,"

(2) ANSI Z136.1-1986, "American National Standard for the Safe Use of Lasers,"

(3) AR 40-46, "Medical Service: Control of Health Hazards from Laser and Other High Intensity Optical Sources,"

(4) AR 385-9, "Safety: Requirements for Military Lasers,"

(5) TB MED 524, "Control of Hazards to Health from Laser Radiation,"

c. The protection standards applied to microwave sources and radio frequency radiation are listed at:

(1) AEHA TG No. 153, "Guidelines for Controlling Potential Health Hazards from Radiofrequency Radiation,"

(2) TB MED 523, "Control of Hazards to Health from Microwave and Radio Frequency Radiation and Ultrasound."

28. Safety Precautions. Safety precautions include a prudent combination of engineering safeguards, administrative measures, personal admonishments, and critical response to an unplanned nonionizing radiological incident. The following criteria is applicable to each LHC:

a. Class I. Exempt laser devices incapable of emitting hazardous laser radiation in excess of maximum permissible exposures for any particular wavelength, exposure period, or viewing condition. This includes selected IR, visible, and UV laser devices.

(1) Inherently safe under prolonged intrabeam viewing of laser beam with or without optical instruments,

(2) Special controls and labels are unnecessary.

b. Class II. Low power, visible laser devices incapable of exceeding one milliwatt of radiant power. There are no invisible (IR or UV) laser emissions of this classification.

(1) Affix caution label to laser housing which alerts reader, "CAUTION: DO NOT STARE INTO LASER BEAM." Forced staring (overcoming one's natural ocular aversive reflex) is hazardous,

(2) Report persistent after-image following ocular exposure to the Occupational Health Clinic (45322) for immediate attention.

c. Class IIIa. Medium power, visible, continuous laser devices capable of 1 to 5 milliwatts of radiant power whose irradiance does not exceed 2.5 mW per sq cm.

(1) Affix caution label to laser housing which alerts reader, "CAUTION: DO NOT STARE INTO LASER BEAM: DO NOT VIEW LASER BEAM WITH UNFILTERED OPTICAL INSTRUMENTS." (Examples of unfiltered optical instruments include transits, mirrors, lenses, telescopes, microscopes, or binoculars,)

(2) Report persistent after-images following ocular exposure to the Occupational Health Clinic (45322) for immediate attention.

d. Class IIIb. Medium power, continuous laser devices capable of 1 to 500 milliwatts of radiant power (Class IIIa excepted). Includes selected IR, visible, UV, and pulsed laser devices.

(1) Admonishments.

(a) Authorized personnel use only,

(b) Avoid careless discharge of laser toward explosive materials - liquids, gases, or vapors - or toxic combustibles,

(c) Avoid discharge of laser into corridors and unguarded hallways outside of secure laboratory bays,

(d) Avoid hand, arm, head, and eye contact with laser beam,

(e) Avoid use of unfiltered optical instruments during prescribed intrabeam viewing,

(f) Be informed of all potentially hazardous chemical, cryogenic, electrical, fire, ocular, skin, and X-ray emissions associated with laser facility,

(g) Inspect laser safety goggles for required optical density, proper usage, and defects IAW TB MED 524 and ANSI Z136.1-1986,

(h) Practice good housekeeping,

(i) Read and understand relevant SOPs, protection standards, maximum permissible exposure (MPE), safety precautions, AMC-R 385-29, Belvoir RD&E Center SOP No. 385-11, TB MED 524, and ANSI Z136.1-1986,

(j) Remove reflective buttons, badges, emblems, rings, mirrors, and wrist watches; eliminate inadvertent reflection of hazardous laser radiation,

(k) Report persistent after-image following ocular exposure to the Occupational Health Clinic (45322) for immediate attention,

(l) Secure all doors whenever continual laser action is unattended,

(m) Wear laser safety goggles of optimum optical density commensurate with the wavelength of the laser's output.

(2) Engineering Safeguards.

(a) Contain or enclose laser beam whenever practical with baffles, guards, or fire brick,

(b) Disengage power prior to maintenance,

(c) Secure interlock or removable key before and after laser action is terminated,

(d) Terminate beam with non-reflective, fire resistant material (do not use asbestos),

(e) Utilize baffles, beam stops, beam enlargers, enclosures, shields, and shutters to control stray and incidental reflections.

e. Class IV. High power, visible, continuous laser devices capable of exceeding 500 milliwatts of radiant power. This includes selected IR, UV, and pulsed laser devices.

(1) Capable of serious ocular damage and skin burn from specular and diffuse reflection,

(2) Alert personnel of imminent discharge of laser radiation,

(3) Apply admonishments and engineering safeguards from Class III lasers as practical,

(4) Apply diffuse non-gloss paint, varnish, or substance to walls and ceiling of laboratory or room housing laser system,

(5) Cover windows and secure a light-tight room,

(6) Discharge capacitors prior to repair or maintenance,

(7) Enclose megajoule lasers in light-tight boxes with interlocks or discharge from remote control site,

(8) Immobilize laser to fixed positions and prescribed beam paths,

(9) Report persistent after-image, vision impairment, or skin burn to the Occupational Health Clinic (45322), or MEDDAC,

(10) Secure door-interlocks at points of entry; engage red warning lamp; post placards at door that read, "DANGER DO NOT ENTER,"

(11) Terminate beam with diffusers, beam stops, non-reflective, or fire resistant material,

(12) Utilize baffles, beam enlargers, optical filters, and shields to minimize incidental diffuse hazardous reflections,

(13) Wear laser safety goggles of optimum optical density commensurate with the wavelength of the laser's output.

f. Collateral Hazards.

(1) Ground frames, enclosures, and nonconductive metallic components of the laser system through a continuous conductor connected to suitable electrical grounding post IAW AMCR 385-100,

(2) Install prescribed fuses, circuit breakers, alarms, and red warning lamps,

(3) Secure cryogenic fluids from spillage, personal contact, and explosive expansion from laser beam impact,

(4) Secure combustible solvents, dyes, and materials from stimulated ignition from laser beam impact,

(5) Shield high voltage terminals and electrical components; denote ON-OFF switches with label,

(6) Ventilate noxious compounds, oxides, ozones, and volatiles if generated.

Section IV

RESPONSIBILITIES

29. Directors. The Center's and CNVEO's Division Directors of Nonionizing Radiation Workers, who are assigned duties at laser, microwave, or R/F labs, rooms, sites, or facilities, will execute the following functions:

a. Appoint a Laser Range Safety Officer IAW AR 385-29, Para 8e(1),

b. Prepare and submit an annual Status Summary Report of Exempted [Military] Lasers (DA Form 4995-1-R, "Annual Status Report of Exempted Lasers," AR 385-9) to the Director, AMC Field Safety Activity (AMXOS-PE), within 10 days after the close of each fiscal year IAW AR 385-29, Para 5d(9),

c. Provide the Laser Safety Officer (LSO) an annual inventory of Exempted Military Lasers, including contract number, national stock numbers, and location of lasers as required.

30. Supervisors. The Center's supervisors and CNVEO's Team Leaders of Laser Workers, who are assigned duties at laser, microwave, or R/F labs, rooms, sites, or facilities, will execute the following functions:

a. Purchase and post appropriate laser or radiological safety signs or notices of warning, caution, or danger, as required,

b. Purchase appropriate laser safety eyewear and ensure that it is worn by laser workers,

c. Post laser SOPs for CNVEO Laser Radiation Protection Program,

d. Maintain a current roster of all nonionizing radiation workers,

e. Maintain current inventory and locations of laser systems, microwave sources, or R/F sources. Secure them against unauthorized use,

f. Coordinate by DF to the LSO (ATTN: STRBE-VR, Building 363, Mail Stop 606) upon changes in inventory or personnel,

g. Contact the Occupational Health Clinic (HSXA-PVM), 45322, Building 815, to assure completion of required initial, periodic, and terminal ocular examination for each Laser Worker or Microwave Worker upon leaving employment,

h. Contact the CNVEO Training Office (AMSEL-RD-NV-RM-PMA) 44386, for required training and instruction in cardiopulmonary resuscitation (CPR) for each nonionizing radiation worker IAW AMCR 385-29, Para 5h(2). Submit DD Form 1556 as requested,

i. Report any suspected nonionizing radiation injuries, accidents, or unusual events to the LSO and the CNVEO Ad Hoc Safety Committee.

j. Escort injured personnel to the Occupational Health Clinic for prompt medical attention,

k. Maintain current copies of:

(1) AMCR 385-29, "Safety: Laser Safety,"

(2) TB MED 524, "Occupational and Environmental Health: Control of Hazards to Health from Laser Radiation,"

(3) All pertinent SOPs.

l. Provide relevant documentation to the LSO upon request.

31. Laser Range Safety Officer (LRSO).

a. Designated Laser Range Safety Officer shall be appointed as required wherever laser target practice and laser ranges are established. The following regulations shall be enforced:

(1) AMCR 385-29,

(2) AR 385-63, "Safety: Policies and Procedures for Firing Ammunition for Training, Target Practice, and Combat," Chapter 20, Lasers,

(3) TB MED 524.

b. Local SOPs shall be written for designated laser ranges. Each SOP shall address safety issues at Para 30 of this SOP as well as reflection hazards, surveillance, communication, and laser range safety features (backstops, protective filters, eyewear, and personal training).

32. Laser and Microwave Workers. The Center's and CNVEO's Laser or Microwave Workers assigned duties at high intensity laser, microwave, and R/F labs, sites, or facilities will complete the following administrative and regulatory requirements:

a. Complete preplacement job-related physical examination IAW Para 25 of this SOP,

b. Observe posted microwave or laser signs and labels of warning, caution, or danger. Read posted documents at Para 30k of this SOP,

c. Report abnormal operating parameters, skin, or ocular exposures to the supervisor; report overexposures to the Occupational Health Clinic for immediate medical attention. Notify the LSO, (45437),

d. Do not attempt unauthorized repair, dismemberment, transfer, or disposal of a microwave or laser system,

e. Report changes in inventory, transfer, or disposal of microwave or laser systems in a DF to the LSO, Attn: STRBE-VR, Building 363,

f. Wear protective apparel and eyewear IAW the Laser Hazard Classification at Para 27 and Para 28 of this SOP,

g. Utilize exhaust hoods and vents whenever hazardous or toxic compounds are volatilized.

33. CNVEO Laser Safety Officer.

a. Monitor the Laser Safety Program as outlined in Belvoir RD&E Center SOP No. 385-11,

b. Coordinate issues of nonionizing radiation safety between CNVEO and higher headquarters,

c. Remain knowledgeable of issues of nonionizing radiation safety and operations, and offer consultative services on nonionizing radiation safety upon request,

d. Maintain a consolidated inventory of lasers: manufacturer, type, classification, use, location, and status of exempt military lasers contract number, national stock number, location, name of responsible individual,

e. Review written SOPs for the safe use of nonionizing radiation sources,

f. Conduct initial and annual inspection of lasers where lasers are used and located,

g. Maintain a list of Laser Workers and immediate supervisors,

h. Act as point of contact for coordination, documentation, and inspection by higher headquarters.

34. Definitions.

a. LASER. (Light Amplification by Stimulated Emission of Radiation). A device which incorporates a characteristic solid, liquid, dye, or gaseous medium capable of population inversion and emission of high intensity, coherent optical radiation.

b. LESION. Any injury, wound, or local morbid change in tissue or organ. A characteristic biological hazard associated with unsafe exposure to high intensity, directional, coherent (laser), optical radiation.

c. MICROWAVE SPECTRA. Electromagnetic radiation of a frequency range between 100 MHz and 300,000 MHz (300 GHz) or corresponding wavelength between 3m and 1mm.

d. NONIONIZING RADIATION. Electromagnetic radiation incapable of generating molecular ions in air or tissue. Radiation characteristic of microwave, radio frequency, and optical spectra.

e. OPTICAL SPECTRA. Electromagnetic radiation of a range of wavelengths between 1.0E+06 nanometers (1 mm) and 1.0E+02 nanometers. The optical spectra is divided between infrared, light, and ultraviolet radiation.

f. RADIO FREQUENCY SPECTRA. Electromagnetic radiation of a frequency range between 10 MHz and 100 MHz or corresponding wavelengths between 30 m and 3 m.

g. ULTRASOUND. Non-electromagnetic radiation. Acoustic or sound energy of a frequency greater than 20,000 Hz.

JUL 26 1988

SECTION V

REFERENCES

35. References.

a. AEHA TG No. 153,

b. AMCR 385-25,

c. AMCR 385-29,

d. AMCR 385-100,

e. ANSI Z136.1-1986,

f. AR 40-5,

g. AR 40-14,

h. AR 40-46,

i. AR 385-9,

j. AR 385-11,

k. AR 385-40,

l. AR 385-63,

m. Belvoir RD&E Center SOP No. 385-11,

n. DoD Notice 6055.8,

o. NRC Regulatory Guide 8.10,

p. TB 43-0116,

q. TB MED 523,

r. TB MED 524,

s. Title 10 Code of Federal Regulation (10 CFR),

(1) 10 CFR 19,

(2) 10 CFR 20,

(3) 10 CFR 21,

t. Title 21 CFR,

u. Title 49 CFR.

(STRBE-VR)

FOR THE COMMANDER:

Peggy K. Flanagan
PEGGY K. FLANAGAN
Administrative Officer

DISTRIBUTION: C + 50 copies STRBE-VR

DEPARTMENT OF THE ARMY

US Army Belvoir Research, Development, and Engineering Center

Materials, Fuels, and Lubricants Directorate

Radiation Research Division

Attn: STRBE-VR

Fort Belvoir, Virginia 22060-5606

ENVIRONMENTAL REPORT

accompanied with renewal of

US Nuclear Regulatory Commission

Byproduct Material License Number

45-00953-01

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1. Proposal. The US Army Belvoir Research, Development, and Engineering Center proposes to renew its US Nuclear Regulatory Commission's (NRC) Material License Number 45-00953-01, expiration dated 31 Jul 89 in accordance with (IAW) Title 10, Code of Federal Regulations, Part 30 (10 CFR 30). This Center proposes to receive, use, store, and transport NRC byproduct material whose aggregate activity in curies does not exceed the Schedule of Limiting Possession Limits IAW Proposed Rule Making at 10 CFR 30. This Environmental Report is submitted concurrent with renewal of NRC Material License Number 45-00953-01, NRC Form 313, Application for Material License, 10 CFR 30.

2. Purpose.

a. This Center reports through Headquarters, US Army Troop Support Command (TROSCOM) and Headquarters, US Army Communications and Electronics Command (CECOM) to US Army Materiel Command (AMC), a major Army command. Concurrent AMC, CECOM, TROSCOM, US Army Center for Night Vision and Electo-Optics, and US Army Belvoir Research, Development, and Engineering Center contractual agreements, military specifications, and mission requirements authorize the procurement, receipt, use, storage, and transport of NRC byproduct (radioactive) material. This material is incorporated into manufactured Department of the Army (DA) commodities, compasses, devices, equipment, indicators, gauges, meters under DA contract. Additional material is purchased as radiological reference standards for calibration of radiation detecting instruments and maintenance of radiological quality assurance and quality control.

b. This Center proposes to continue its use and storage until transport or disposal to authorized NRC licensee of the following NRC authorized byproduct material:

	Element and mass number:	Chemical and/or physical form:	Maximum amount:
(1)	Any byproduct material of atomic numbers 5 through 95, inclusive.	Sealed: any chemical or physical form as any gauge, device, calibrated or reference standard, or Department of the Army commodity, device, gauge, indicator, meter, or tube.	Not to exceed 5 curies per radionuclide and 10 curies of total activity.
(2)	Hydrogen-3.	Sealed luminous sources: gas, paint, or phosphor, as any calibrated or reference standard, EXIT sign, or Department of the Army commodity, compass, device, gauge, indicator, or meter.	Not to exceed 25 curies per source and 500 curies of total activity.

c. Byproduct material of generally less than one microcurie per source will be used for calibration, quality control, and reference check of non-portable gas flow proportional counters, gamma spectrometers, and liquid scintillation counters.

d. Byproduct material of generally less than 100 millicuries per source as received and incorporated in moisture density gauges, gas chromatographs, photometers, smoke detectors, surge arresters, and otherwise incorporated in commercially available products or DA devices, gauges, indicators, and meters, will be used in accordance with manufacturer's or DA specifications as appropriate.

e. Byproduct material of generally less than 1 curie per source of either americium-241, cobalt-60, or cesium-137 as incorporated into Department of the Army devices will be stored for purpose of disposal IAW Federal regulations.

f. Hydrogen-3 as received and incorporated in DA compasses, EXIT signs, gauges, indicators, meters, or radioluminescent devices will be tested, measured, developed, or evaluated for quality assurance and quality control IAW published DA specifications and military standards, and American National Standards Institute.

g. This Center further proposes to reduce and maintain unnecessary environmental exposures and dose equivalent that are as low as reasonably achievable (ALARA) which is detailed 10 CFR 20 and US Army Belvoir RDE Center's Standing Operating Procedure (SOP) Number 385-11, Safety: Radiation Protection Program.

h. Historical records to date document dose equivalent to Radiation Workers under this license at less than 1 percent of the limits specified at 10 CFR 20.202 and less than 10 per cent of the limits specified at US Army Belvoir RDE Center's SOP 385-11, Section II, Para 19(e), ALARA.

3. Alternatives. Substitution of nonradioactive nuclides will preclude performance of selected US Army Belvoir RDE Center's mission directives which are subordinate to DA quality assurance procedures, military specifications, concurrent contractual agreements, and DA rules and regulations. The radioactive nature of NRC byproduct material is incidental to their electrical, optical, mechanical, luminescent, phosphorescent, and physical properties which are characteristic of alloys, electronic components, gauges, glasses, meters, phosphors, and calibrated reference standards. NRC byproduct materials are essential for accurate calibration of radiation detecting and measuring devices, which identifies and measures unknown sources of naturally occurring, environmental, and man-made radioactive sources. Analyses identify inherent radiological properties essential to sound radiation protection practices as detailed at US Army Belvoir RDE SOP 385-11. Materials of required properties can not be separated from their incidental radiological characteristics. This Center can not complete selected mission requirements with nonradioactive substitutes.

4. Environmental Impact.

a. All NRC byproduct material is controlled and use by authorized civilians and military personnel IAW US Army Belvoir RDE Center SOP 385-11. Radioactive materials are confined, secured, and utilized in specifically designated laboratory rooms and storage vaults. Personnel are monitored for dose equivalent with thermoluminescent dosimeters or film badges which are attached to their wearing apparel IAW references at Para 7 of this Report. Individual bioassay samples are collected and evaluated monthly as required. Designated laboratory rooms are equipped with environmental air monitors. Individual and environmental monitors document exposures to dose equivalent that is ALARA in compliance with Federal rules and regulations at Para 7 of this Report. Unwanted radioactive materials and contaminated wastes will be collected and packaged at this Center and transported for disposal IAW Federal rules and regulations at Para 7 of this Report. Advance instructions will be secured from Commander, US Army Armament, Munitions, and Chemical Command before final preparation and transport of unwanted radioactive materials and contaminated wastes for controlled NRC licensed burial from this Center. Gaseous radionuclides may be discharged to the environment under controlled condition in concentrations not exceeding standards listed at 10 CFR 20. Solutions of radionuclides will be diluted before discharge to sewer in concentrations not exceeding standards listed in 10 CFR 20.

b. Periodic, routine, or daily radiological measurements, calculations, and surveys document control and regulatory compliance of 10 CFR. Contaminated wastes will be transported to NRC licensed authority. Continued use and storage of NRC byproduct material at this Center presents no adverse environmental impact upon renewal of NRC Byproduct Material License Number 45-00953-01, NRC Form 313, Application for Material License, 10 CFR 30.

5. Compliance. As described in this Environmental Report, this Center is in compliance with all applicable DA, DOT, EPA, and NRC rules and regulations that authorize receipt, use, and transport of NRC byproduct materials. Recent inspections by independent Federal inspectors further demonstrate compliance with applicable Federal rules and regulations:

a. HQ, TROSCOM, 'Radiation Protection Survey, US Army Belvoir RDE Center, Fort Belvoir, Virginia, 20 September 1988.'

b. NRC Form 591, 'Safety Inspection', dated 2 September 1987.

c. US Army Environmental Hygiene Agency 'Radiation Protection Survey No. 27-43-0106-88, US Army Belvoir RDE Center, Fort Belvoir, Virginia, 1-2 December 1987.'

d. US Army Materiel Command Field Safety Activity, 'Safety Program Evaluation,' 3-7 March 1986.

e. US Army Environmental Hygiene Agency 'Radiation Protection Survey No. 28-43-0636-85, US Army Belvoir RDE Center, Fort Belvoir, Virginia, 26-27 November 1084.

6. Persons Consulted:

a. Dr. Gaines C. Ho, Chief: Safety, Health, and Environmental Office, US Army Belvoir RDE Center, Attn: STRBE-Q, Ft. Belvoir, VA 22060-5606.

b. Dr. Ramachandra K. Bhat, Chief, Radiation Research Division, (Materials, Fuels, and Lubricants Directorate), US Army Belvoir RDE Center, Attn: STRBE-VR. Ft. Belvoir, VA 22060-5606.

c. Mr. Michael D. Funkhouser, Radiation Protection Officer, US Army Belvoir RDE Center and US Army Center for Night Vision and Elecro-Optics Center, Attn: STRBE-VR, Ft. Belvoir, VA 22060-5606.

7. References:

a. Army Regulation 40-14, Medical Services: Control and Recording Procedure for Occupational Exposure to Ionizing Radiation.

b. Army Regulation 200-2, Environmental Quality: Environmental Effects of Army Actions.

c. Army Regulations 385-11, Safety: Ionizing Radiation Protection.

d. US Army Belvoir RDE Center SOP 385-11, Safety: Radiation Protection Program.

e. Title 10 CFR.

f. Title 39 CFR.

g. Title 49 CFR.

h. US Army Armament, Munitions, and Chemical Command Pamphlet 385-1, Safety: Handbook for Disposal of Unwanted Radioactive Material.