DEPARTMENT OF THE ARMY
HEADQUARTERS US ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND
5001 EISENHOWER AVE., ALEXANDRIA, VA. 22333

Renewal address

DRCSF-P/78-0057

7 June 1978

Director
Nuclear Material Safety and Safeguards
ATTN: Radioisotopes Licensing Branch
US Nuclear Regulatory Commission
Washington DC 20555

Gentlemen:

Forwarded is US Army Electronics Research and Development Command application for renewal and amendment in its entirety of Byproduct Material License Number 29-01022-10.

Please acknowledge receipt of correspondence on enclosed NRC-46 Reply Card.

Sincerely,

DARWIN N. TARAS
Chief, Health Physics
Safety Office

2 Incl
as

CF:
HQDA (DASG-HCH-E) WASH DC 20310
Dir, DARCOM FSA, Charlestown IN 47111

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Form AEC-313
(2-73)
10 CFR 30

UNITED STATES ATOMIC ENERGY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE

Form approved
Budget Bureau No. 38-R0027

INSTRUCTIONS.—Complete Items 1 through 16 if this is an initial application or an application for renewal of a license. Information contained in previous applications filed with the Commission with respect to Items 8 through 15 may be incorporated by reference provided *references are clear and specific.* Use supplemental sheets where necessary. Item 16 must be completed on all applications. Mail two copies to: U.S. Atomic Energy Commission, Washington, D.C., 20545, Attention: Materials Branch, Directorate of Licensing. Upon approval of this application, the applicant will receive an AEC Byproduct Material License. An AEC Byproduct Material License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Part 20, and the license fee provisions of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 16 and the appropriate fee enclosed. (See Note in Instruction Sheet).

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

Department of the Army
US Army Electronics Research and Development Command
ATTN: DELSD-SF
Fort Monmouth, NJ 07703 201-544-5292

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

~~03120~~ ~~601022~~

Building 401, Evans Area
Fort Monmouth, New Jersey 07703

~~030-14620~~

2. DEPARTMENT TO USE BYPRODUCT MATERIAL

Electronic Technology & Devices Laboratory

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

29-01022-10 - Renew and amend in its entirety

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.)*

Persons designated by the Ionizing Radiation Control Committee

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, RPO
Michael J. Davison, Alternate RPO
See Inclosure #1 for resumes

6. (a) BYPRODUCT MATERIAL. *(Elements and mass number of each.)*

Cobalt 60

(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.)*

Cobalt metal double sealed in sources 0.945 inches in diameter by 10.7 inches long. Each source approximately 1000 curies. Total activity not to exceed 125,000 curies.

Sources encapsulated per drawing Curtis-Wright D700129F

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.)*

Irradiation of nonexplosive material for research

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(Continued on reverse side)

Rec'd 6/12/78

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

8. TYPE OF TRAINING	WHERE TRAINED	DURATION OF TRAINING	ON THE JOB (Circle answer)	FORMAL COURSE (Circle answer)
a. Principles and practices of radiation protection			Yes No	Yes No
b. Radioactivity measurement standardization and monitoring techniques and instruments	See Inclosure #2		Yes No	Yes No
c. Mathematics and calculations basic to the use and measurement of radioactivity			Yes No	Yes No
d. Biological effects of radiation			Yes No	Yes No

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

ISOTOPE	MAXIMUM AMOUNT	WHERE EXPERIENCE WAS GAINED	DURATION OF EXPERIENCE	TYPE OF USE
		See Inclosure #2		

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

TYPE OF INSTRUMENTS *(Include make and model number of each)*	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE *(mr/hr)*	WINDOW THICKNESS *(mg/cm²)*	USE *(Monitoring, surveying, measuring)*
	See Inclosure #4				

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

See Inclosure #5

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

See Inclosure #6

INFORMATION TO BE SUBMITTED ON ADDITIONAL SHEETS IN DUPLICATE

13. FACILITIES AND EQUIPMENT. Describe laboratory facilities and remote handling equipment, storage containers, shielding, fume hoods, etc. Explanatory sketch of facility is attached. *(Circle answer)* (Yes) No See Inclosures #4 & 7

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 Inclosure #8

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. In accordance with AR 755-15

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.

FOR THE COMMANDER:

License Fee Category $ _____

Fee Enclosed $ _____

Date _____

Applicant named in item 1

By: Walter S. McAfee

WALTER S. MCAFEE

CG's Representative on Ionizing Radiation Control Committee

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.

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1. Inclosure #1 - Resumes of RPO, Alternate RPO and others authorized to perform leak test operations.

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7. Inclosure #7 - Facility & containers, S.O.P.

8. Inclosure #8 - Radiological Protection Program and Leak test procedures

INCLOSURE #1

Resumes of RPO, Alternate RPO and others authorized to perform leak test operations

Resume of Training and Experience
of Stanley B. Potter

1. Educational background:

Colorado State University	4 yrs	1961	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, NHTC

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

1972-1978 With US Army Electronics Command, Fort Monmouth, NJ as Health Physicist

1978-Pres US Army Electronics Research & Development Command, Fort Monmouth, NJ, as Health Physicist

3. Formal Training in Radiation:

a. Principles and practices of radiation protection.

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

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

Where Trained	Duration of Training
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.

Where Trained	Duration of Training
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.

Where Trained	Duration of Training
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.

Where Trained	Duration of Training
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	5 yrs - 1972-Present

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

Where Trained	Duration of Training
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	5 yrs - 1972-Present

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

Where Trained	Duration of Training
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	5 yrs - 1972-Present

5. Experience with radioisotopes.

Isotope	Maximum Activity	Place of Experience	Duration of Experience
^{226}Ra	Less than 10 curies	Colorado State University	3 mo
		Naval Postgraduate School	3 mo
		Fort Monmouth, New Jersey	5 yrs
^{60}Co	Kilocuries	Colorado State University	3 mo
		Chemical Corp School	6 mo
		Naval Postgraduate School	3 mo
		Albuquerque, New Mexico	3 yrs
		Fort Monmouth, New Jersey	5 yrs
^{241}Am	Millicuries	Albuquerque, New Mexico	3 yrs
^{147}Pm	Hundreds of curies	Cape Kennedy, Florida	1 mo
		Albuquerque, New Mexico	3 yrs
		Cape Kennedy, Florida	1 mo
		Fort Monmouth, New Jersey	5 yrs
^{239}Pu	Curies	Albuquerque, New Mexico	3 yrs
		Fort Monmouth, New Jersey	5 yrs
^{57}Co	Millicuries	Albuquerque, New Mexico	1 yr
		Fort Monmouth, New Jersey	5 yrs
^{232}Th	Kilocuries	Albuquerque, New Mexico	3 yrs
		Fort Monmouth, New Jersey	5 yrs
^{229}Th	Curies	Edgewood, Maryland	3 yrs
Tritium(^{3}H)	Hundreds of curies	Edgewood, Maryland	3 yrs
		Albuquerque, New Mexico	3 yrs
		Fort Monmouth, New Jersey	5 yrs
^{131}I	Millicuries	Edgewood, Maryland	1 yr
		Naval Postgraduate School	1 yr
^{210}Po Be	Curies	Edgewood, Maryland	3 yrs
^{239}Pu Be	Curies	Edgewood, Maryland	3 yrs
^{192}Ir	Hundreds of curies	Cape Kennedy, Florida	1 mo
^{85}Kr	Hundreds of curies	Cape Kennedy, Florida	1 mo
		Fort Monmouth, New Jersey	5 yrs
^{238}U	Millicuries	Albuquerque, New Mexico	3 yrs
		Fort Monmouth, New Jersey	5 yrs

Isotope	Maximum Activity	Place of Experience	Duration of Experience
^{90}Sr	Millicuries	Germany	3 yrs
		Albuquerque, New Mexico	3 yrs
		Colorado State University	3 mo
		Fort Monmouth, New Jersey	5 yrs
^{90}Y	Millicuries	Germany	3 yrs
		Albuquerque, New Mexico	3 yrs
		Colorado State University	3 mo
		Fort Monmouth, New Jersey	5 yrs

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

DEVICE	PLACE OF EXPERIENCE	DURATION
Cockroft Walton Accelerator	Edgewood, Maryland	2 years
Betatron	Edgewood, Maryland	1 year
Van de Graaff Accelerator	Naval Postgraduate School	1 year
	Fort Monmouth, New Jersey	5 years
Neutron Generator	Fort Monmouth, New Jersey	5 years
X-Ray Machines	Fort Monmouth, New Jersey	5 years

Resume of radiation background: Joseph H. Crotchfelt

Position: Supervisor of Radiation Facility

Title: Engineering Tech.

Education: Courses in Basic Radiological Health and Occupational Radiation Protection given by US Dept of Health, Education & Welfare. On the job training at the Pacific Proving Ground (PPG) and the Nevada Test Site (NTS).

Experience: Mr. Crotchfelt has been working in the field of radiation measurement, handling anddecontamination since 1956. He originally received instruction on the principles and practices of radiation protection, radioactivity measurement & monitoring techniques & instruments, calculations basic to the use and measurement of radiation at the PPG in 1956. Since then he has had additional instruction and experience on-the-job in these laboratories in radiation measurement, instrument calibration, wipe tests, and decontamination. His experience in PPG and NTS include recovery, radiation measurement, decontamination and instrument calibration. He was responsible for the fabrication & mechanical design changes of the Biosel IM/111, a radiac meter designed to plug into Aircraft or be self-contained with batteries. Designed source holders & loaded same. Maintains, operates & assists in experiments on the two (2) million volt Van de Graaff particle accelerator that has a dual capability of electrons or positive ions. Maintains, operates and takes part in experiments on the 3500 Ci Cobalt 60 Facility. Maintains, operates and conducts experiments on the Kaman Model A-1001 Neutron Generator.

Actual use of isotopes is as follows:

ISOTOPES	MAXIMUM AMOUNT	TYPE OF USE
^{137}Cs	220 Ci	research
^{60}Co	125 kCi	research
^{90}Sr	1 Ci	detectors
^{3}H	90 Ci	replenisher
^{210}Po	10 Ci	research
^{241}Am	100 uCi	research
^{226}Ra	10.3 mCi	research
$^{226}RaBe$	20 mCi	calibration
^{239}Pu	2 uCi	research
^{147}Pm	300 mCi	research
^{85}Kr	50 mCi	research

Resume of Training and Experience
of Michael J. Davison

1. Educational background

US Army Facilities Engineering Support Agency School	52 weeks	1977	Compl Nuclear Power Plant Operator (Health Physics - Process Control Specialty)

2. Vocational experience with radiation

1977	1 week OJT aboard MH-1A (Nuclear Power Barge STURGIS at Fort Belvoir, VA as Health Physics Technician.)
1977-1978	Facilities Engineering Support Agency, Fort Belvoir, VA as Instructor, Health Physics Training Division.
1978-Pres	Electronics Research & Development Command, Fort Monmouth, NJ, as Health Physics Technician.

3. Formal training in radiation

a. Principles and practices of radiation protection

Where Trained	Duration of Training
Nuclear Power Plant Operator School	52 weeks

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

Where Trained	Duration of Training
Nuclear Power Plant Operator School	36 weeks

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

Where Trained	Duration of Training
Nuclear Power Plant Operator School	52 weeks

d. Biological effects of radiation.

Where Trained	Duration of Training
Nuclear Power Plant Operator School	20 weeks

4. On-the-job training in radiation

a. Principles and practices of radiation protection.

Where Trained	Duration of Training	
MH-1A (Nuclear Power Barge STURGIS)	1 wk	1977
Fort Monmouth, NJ	1 mo	1978

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

Where Trained	Duration of Training	
MH-1A (Nuclear Power Barge STURGIS)	1 wk	1977
Fort Monmouth, NJ	1 mo	1978

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

Where Trained	Duration of Training	
MH-1A (Nuclear Power Barge STURGIS)	1 wk	1977
Fort Belvoir, VA	4 mo	1977-1978
Fort Monmouth, NJ	1 mo	1978

5. Experience with radioisotopes

Isotope	Maximum Activity	Place of Experience	Duration of Experience
^{241}Am	Millicuries	Nuclear Reactor School Fort Monmouth, NJ	15 months 1 month
^{14}C	Millicuries	Nuclear Reactor School Fort Monmouth, NJ	15 months 1 month
^{36}Cl	Millicuries	Nuclear Reactor School Fort Monmouth, NJ	15 months 1 month
^{60}Co	Millicuries 125,000 Curies	Nuclear Reactor School Fort Monmouth, NJ	15 months 1 month
^{137}Cs	Millicuries Hundreds of Curies	Nuclear Reactor School Fort Monmouth, NJ	15 months 1 month

Isotope	Maximum Activity	Place of Experience	Duration of Experience
^{3}H	Curies	Fort Monmouth, NJ	1 month
^{147}Pm	Millicuries	Nuclear Reactor School	15 months
^{239}Pu	Millicuries	Nuclear Reactor School Fort Monmouth, NJ	15 months 1 month
^{239}Pu-Be	Curies	Nuclear Reactor School	15 months
^{90}Sr, ^{90}Y	Millicuries Curies	Nuclear Reactor School Fort Monmouth, NJ	15 months 1 month

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

Device	Place of Experience	Duration
Van de Graaff Accelerator	Fort Monmouth, NJ	1 month
X-Ray Diffraction	Fort Monmouth, NJ	1 month
Positive Ion Accelerator	Fort Monmouth, NJ	1 month
Radiographic X-Ray System	Fort Monmouth, NJ	1 month
Medical X-Ray Unit	Fort Monmouth, NJ	1 month

Resume of Training and Experience
of Dr. Stanley Kronenberg

1. Educational background:

PhD in Physics, University of Vienna, 1952

2. Vocational experience with radiation:

1951-1952	With Institute for Radium Research, Vienna, Austria as Researcher.
1952-1953	At the General Hospital of Vienna, Austria, as Radioisotope and nuclear radiation researcher, medical applications.
1953-Present	With US Army Signal Labs, Fort Monmouth, NJ Electronic Command, ERADCOM Supervisor Research Physicist

3. Formal Training in Radiation:

a. Principles and practices of radiation protection.

Where Trained	Duration of Training
University of Vienna	1948-1952

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

Where Trained	Duration of Training
University of Vienna	1948-1952

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

Where Trained	Duration of Training
University of Vienna	1948-1952

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4. On-the-job training in radiation.

a. Principles and practices of radiation protection.

Where Trained	Duration of Training
University of Vienna	1948-1952
Institute for Radium Research	1950-1952
Vienna General Hospital	1952-1953
Fort Monmouth, NJ	1953-Present

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

Where Trained	Duration of Training
University of Vienna	1948-1952
Institute for Radium Research	1950-1952
Vienna General Hospital	1952-1953
Fort Monmouth, NJ	1953-Present

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

Where Trained	Duration of Training
University of Vienna	1948-1952
Institute for Radium Research	1950-1952
Vienna General Hospital	1952-1953
Fort Monmouth, NJ	1953-Present

5. Experience with radioisotopes.

Isotope	Maximum Activity	Place of Experience	Duration of Experience
Radium and Derivitives	2 Ci	Inst of Radium Res, Vienna	2 yrs
^{131}I	1 Ci	Inst of Radium Res, Vienna	2 yrs
^{90}Sr	3 Ci	Inst of Radium Res, Vienna	2 yrs
^{137}Cs	220 Ci	Fort Monmouth, New Jersey	25 yrs
^{60}Co	125 kCi	Fort Monmouth, New Jersey	25 yrs
^{90}Sr	5 Ci	Fort Monmouth, New Jersey	25 yrs
^{210}Po	10 Ci	Fort Monmouth, New Jersey	25 yrs
^{241}Am	100 uCi	Fort Monmouth, New Jersey	25 yrs
Ra & Be neutron source	20 mCi	Fort Monmouth, New Jersey	25 yrs
^{239}Pu	20 lbs (fast burst reactor)	Aberdeen Proving Ground, Md.	5 yrs
^{235}U	20 lbs (fast burst reactor)	Aberdeen Proving Ground, Md.	5 yrs
^{85}Kr	1 Ci	Fort Monmouth, New Jersey	25 yrs
^{27}Na	100 mCi	Fort Monmouth, New Jersey	25 yrs
^{3}H	90 Ci	Fort Monmouth, New Jersey	25 yrs

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

DEVICE	PLACE OF EXPERIENCE	DURATION
2 Mev Van de Graaff	Fort Monmouth, New Jersey	25 yrs
X-ray Machines	Fort Monmouth, New Jersey	25 yrs
Linear accellerator	White Sands Missile Range	25 yrs (occassional use)
Cocroft Walton Accellerator	Edgewood, Maryland	25 yrs (occassional use)
Flash X-Rays (e.g. FX 100)	Fort Monmouth, New Jersey	25 yrs
Cyclotrons	Brookhaven National Laboratory	25 yrs (occassional use)
Nuclear Reactors	Oak Ridge, Tennessee	25 yrs (occassional use)

Authored 45 scientific papers and reports in the areas of nuclear radiation, dosimetry, biology, radiation transport, tactical dosimetry, etc.

Member: American Nuclear Society

Holds 5 patents in the area of radiation dosimetry.

Served on 5 occasions as project officer at nuclear weapon tests.

INCLOSURE #2

IONIZING RADIATION CONTROL COMMITTEE

Ionizing Radiation Control Committee (IRCC)

1. Reference items 8 and 9 of NRC Form 313.

2. The Ionizing Radiation Control Committee will consist of persons working in the positions indicated below. From time to time different individuals will work in these positions. The characteristic qualifications that are required of the individual in each position are indicated. The IRCC is a composite committee consisting of members from all pertinent Fort Monmouth organizations. The purpose of the IRCC is to set policy with regard to use of ionizing radiation, to approve workers to use ionizing radiation, to approve radiation facilities and to approve applications for NRC licences.

Chief, Radiologist, Patterson Army Hospital

Physician with extensive experience in use of diagnostic radiation.

Safety Director, US Army Communications and Electronics Materiel Readiness Command (CERCOM)

Extensive experience in industrial safety with administrative experience in radiological safety.

Chief of Environment and Health Activity, Patterson Army Hospital

Industrial Hygienest or Environmental Engineer with varying amount of training and experience in radiological safety.

Chief of Equipment Management Branch of ERADCOM Technical Support Activity

Supply and logistics expert with experience in transportation and shipping.

Health Physicist, CERCOM Safety Office

Extensive formal and practical training in radiological safety.

Safety Specialist, CERCOM Safety Office

Extensive experience in industrial safety and ordinarily 2 to 4 weeks formal training in radiological safety.

Chief, Radiation Research Branch, ERADCOM's Electronic Technology and Devices Laboratory

Extensive training and experience in use of radiation, radiation measurement and detection, and radiological safety.

Physicist, research, Radiation Research Branch, ERADCOM

Extensive experience and training in use of radiation, radiation measurement and detection and radiological safety procedures.

Leader, Dosimetry and Calibration Team, Radiac Research and Development Group, ERADCOM

Minimum of a bachelors degree in a physical science or engineering with extensive experience in radiation detection, measurement and safety.

Scientific Advisor to Commander ERADCOM

Extensive education and experience in science and engineering. At least familiarization training and experience in radiological safety.

Maintenance Engineer, Maintenance Directorate, CERCOM

An expert in Maintenance Engineering.

INCLOSURE #3

DRAWINGS OF SOURCE CONTAINER TANKS

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Inclosure #3

1. Reference item 3 of NRC Form 313

2. Fig. 1 shows the location of the pool irradiator with respect to the other facilities in bldg 401. Fig. 2 gives a cross-section view of the storage tank. Fig. 3 gives a cross-section view of the storage tank with a larger view of the emergency storage tank.

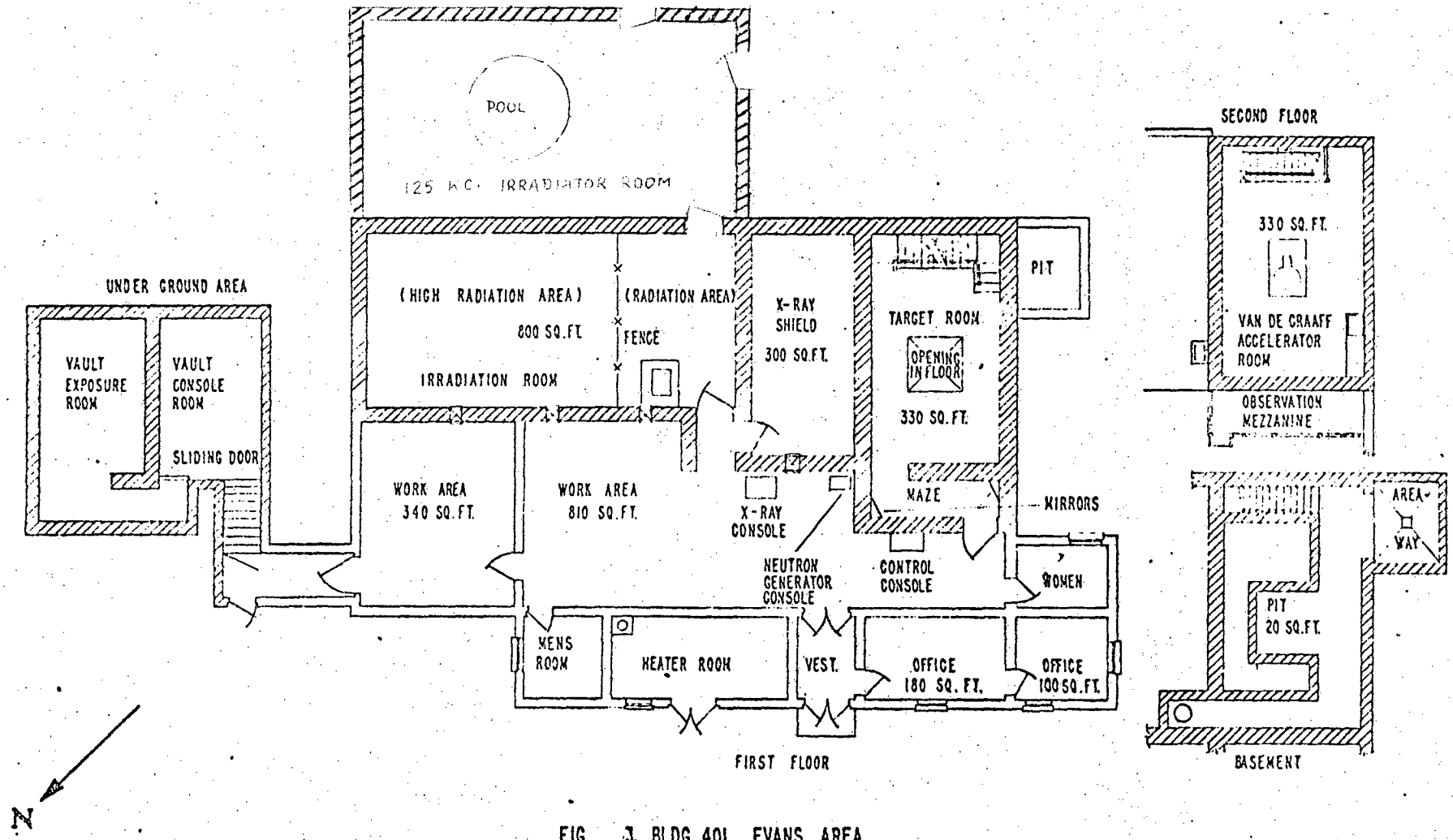


FIG. 1 BLDG 401, EVANS AREA

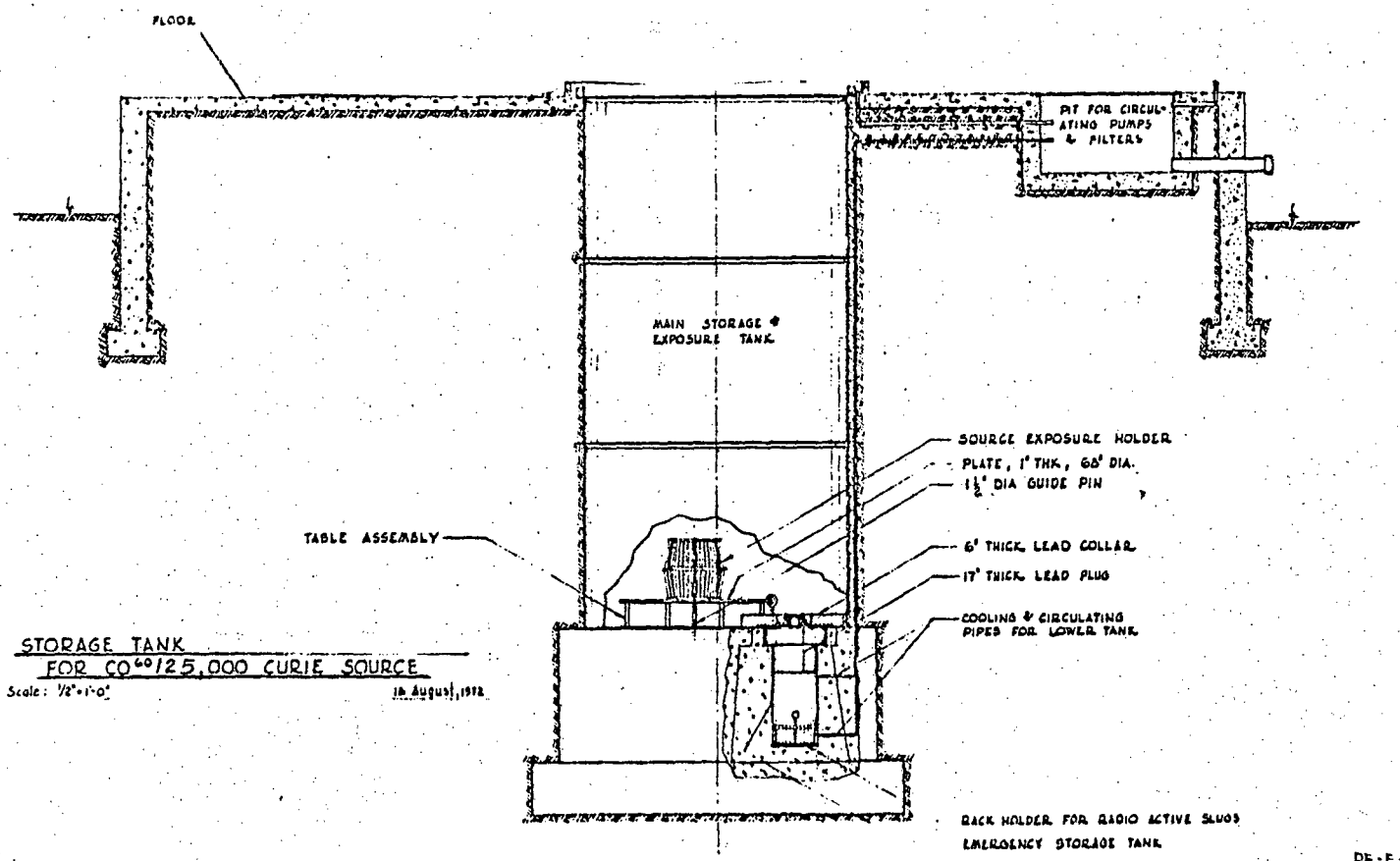
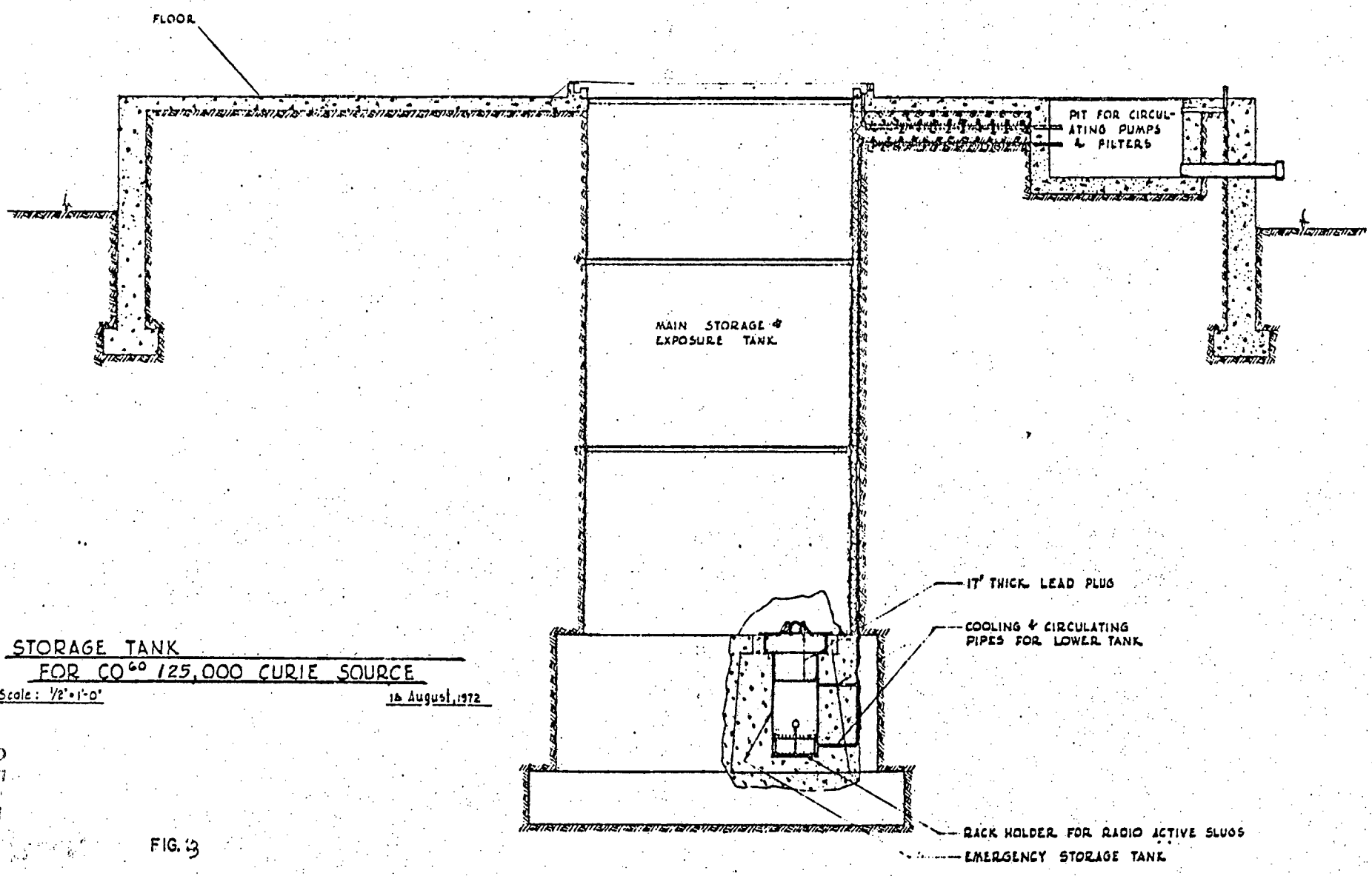

FLOOR
PIT FOR CIRCULATING PUMPS & FILTERS
MAIN STORAGE & EXPOSURE TANK
SOURCE EXPOSURE HOLDER
PLATE, 1" THK., 68" DIA.
1½" DIA GUIDE PIN
TABLE ASSEMBLY
6" THICK LEAD COLLAR
17" THICK LEAD PLUG
COOLING & CIRCULATING PIPES FOR LOWER TANK
RACK HOLDER FOR RADIO ACTIVE SLUGS
EMERGENCY STORAGE TANK
STORAGE TANK
FOR CO60 125,000 CURIE SOURCE
Scale: 1/2"=1'-0"
18 August, 1958
PF-F-2834
CO60 FAC.
EVANS AREA

FIG. 2



STORAGE TANK
FOR CO^{60} 125,000 CURIE SOURCE

Scale: 1/2" = 1'-0"

18 August, 1972

FIG. 3

85175 3-4

INCLOSURE #4

RADIATION DETECTION INSTRUMENTS

[redacted]

RADIATION DETECTION INSTRUMENTS

1. Reference item 10 of NRC Form 313.

2. The radiation detecting and measuring instruments listed in this supplement are the instruments presently on hand. Instruments may be added or deleted from this inventory during the normal course of use and procurement, but the general overall capabilities of radiation detection and measurement will be maintained. Attached table lists the portable radiation detection instruments.

3. In addition to the instruments listed in the table, the following laboratory instruments are available.

a. Scalers for use with shielded GM tubes, gas flow and scintillating detectors.

b. Single channel pulse height analyzers.

c. Victoreen R meters with reader.

d. 1024 channel pulse height analyzer with 3" x 3" NaI(Tl) Crystal and 5" x 5" NaI(Tl) Crystal with plastic tank for liquid analysis.

INCLOSURE 4. PORTABLE RADIATION DETECTION INSTRUMENTS

TYPE INSTRUMENT	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE	WINDOW THICKNESS	USE
Bendix 611	3	Gamma	5,000 mR	NA	Dosimeter
Bendix 862	3	Gamma	200 mR		Dosimeter
Victoreen 541A	4	Gamma	200 mR		Dosimeter
Landsverk IM9EPD	3	Gamma	200 mR		Dosimeter
JAN IM147	5	Gamma	50,000 mR		Dosimeter
Bendix 884 Tissue equivalent	4	Gamma neutron(fast)	200 mR		Dosimeter
Bendix 609	4	neutron (thermal)	120 mrem		Dosimeter
Nucleus Tissue Equivalent	1	Gamma neutron(fast)	200 mR		Dosimeter
Victoreen 440RF	2	Gamma	300 mR/hr	1 mg/cm^2 mylar & 0.005 magnesium	Survey Measuring
Victoreen 440	2	Beta Gamma	300 mR/hr	1 mg/cm^2 mylar & 0.005 magnesium	Survey Measuring
Victoreen 740	2	Alpha Beta Gamma	2500 mR/hr	0.005 mylar	Survey Measuring
Radiac Set AN/PDR 27	3	Beta Gamma	500 mR/hr (4 scales)	GM Tubes JAN 5980 & JAN 5979 Mil-E-1	Survey Measuring
Radiac Set AN/PDR-39	2	Gamma	50,000 mR/hr	thick wall Ion ch	Survey Measuring

Nuclear-Chicago 2610-A-P.15	2	Beta Gamma	20 mR/hr	Thin wall GM tube D50	Survey Measuring
Nuclear-Chicago 2612-P.16	2	Beta Gamma Alpha	20 mR/hr	1.4 mg/cm^2	Survey Measuring
Baird-Atomic 420E	2	Beta Gamma Alpha	12½ mR/hr	End window GM tube	Survey Measuring
Nuclear-Chicago 2612	1	Beta Gamma	20 mR/hr	Thin wall GM tube	Survey Measuring
Eberline PIC-6	2	Gamma	1000 mR/hr		Survey Measuring
AN/PDR-52	1	Beta Gamma Alpha	1000 mR/hr	Thin mylar	Survey Measuring
Eberline PRM 5-3 w/HP 260 probe	2	Beta Gamma Alpha	500,000 CPM	2 mg/cm^2	Survey Measuring
Eberline E-500B	1	Beta Gamma	2000 mR/hr	Thin wall GM	Survey Measuring
Chirpee 904517	3	Gamma	1 chirp/.1 mR	GM tube	Warning Dosimeter
Chirpee PRM 253	5	Gamma	1 chirp/.1 mR	GM tube	Warning Dosimeter
Mighty Mite	2	air sampler			Air Sampling

INCLOSURE #5

CALIBRATION

Inclosure #5

1. Reference Form NRC - 313 item 11

2. Gamma instruments are calibrated every 3 months using ^{60}Co or ^{137}Cs sources. The calibration of the sources is checked at least once a year using Victoreen R-meters or RADCON II. The R-meters or RADCON II are in turn calibrated by National Bureau of Standards annually and certified to $\pm$ 3%. The source intensities are corrected each month for decay.

INCLOSURE #6

DOSIMETRY

Inclosure #6

1. Reference Form NRC - 313 - item 12.

2. Lexington-Blue Grass Army Depot Activity film badge service is used for personnel monitoring on a monthly basis.

3. Quartz fiber dosimeters are used whenever personnel work in a radiation area and are checked during and at the end of each day spent in the radiation area.

4. In addition, personnel working in a high radiation area use Personal Radiation Monitors (Chirpees, rad-Tad, Monitalert).

INCLOSURE 7

FACILITY AND CONTAINERS AND SOP

Inclosure #7

1. Reference Item 13 of NRC Form 313.

2. The following facilities and containers are described:

   a. Building T-383 - Isotope Storage Vault

   b. Building S-45

   c. Building 401 and storage tank for 125,000 curie ^{60}Co source

   a. Material Storage Vault Bldg T-383. (Sketch on page 7-7)

   Drawing, Fig. J-3, shows the radioactive material storage vault.

This building is used to store radioactive materials. Waste is also stored here until it is disposed of.

   b. Building S-45. (Sketch on page 7-6)

   Drawing, Fig. J-4, shows the decontamination room and processing room located in Building S-45. The processing room is provided with remote handling equipment, (sufficient to handle up to one curie) glove box, and ventilated hood (100 linear feet per minute across opening when half open). A Scott airpack breathing system is available. Cover-alls, surgical caps and gloves, and booties are also available in various sizes. All work surfaces are stainless steel designed to contain spills.

The decontamination room contains a shower, sink, absorbent paper with waterproof backing, and chemical aspects for decontamination. Sewage is stored in an underground tank and the controls for dilution before permitting it to enter regular sewage are located in the processing room.

Lead bricks are available for shielding radioactive materials while under hood, in glove box, or on other work surfaces, or for temporary storage while waiting use.

c. Bldg 401 and Storage Tank for 125,000 Curie ^{60}Co Source

The storage tank is located in a separate room of Building 401 (Radiological Shield) Fig #3 Inclosure #3, and is incorporated as a working source in the radiological facilities. The tank is made of 1/4" stainless steel, 10 feet in diameter, 20 feet deep. An emergency safety tank is located in the bottom of the large tank; it is 20 inches in diameter by 48" deep and is equipped with a separate circulating and cooling system. Should the need ever arise to modify, maintain or repair the large tank the source slugs will be placed in a special basket which will be lowered to the bottom of the small tank. This tank will be covered with a 17" thick lead plug, plus a 6" thick lead collar which will fit over the plug; this will reduce the radiation (less than 100 mr/hr) to a level which may be considered "safe" under emergency conditions so that water can be removed from the large tank for any necessary repairs or adjustments.

The water in the large storage tank will be circulated through filters, deionized, cooled, and kept at the highest practical resistivity to reduce the problem of corrosion.

The source slugs normally will be contained in a special source exposure container located in the bottom of the exposure tank (Figures #1 & 2, inclosure #3) especially made for this purpose. A water level alarm is installed on the tank to detect the loss of water. If the level of the water in the tank should drop more than 6" an audible alarm will sound and a red light will activate. This condition will remain in effect until the water level is raised to its proper height. A remote area monitoring system is used to continuously monitor the area surrounding the tank and the water flowing

through the deionizer. A detector is installed near the storage tank and also adjacent to the deionizer, which will set off an audible alarm should there be a significant increase in radiation.

The sources are permanently installed in the storage exposure rack and will remain at tge bottom of the storage tank at all times. Material to be exposed is lowered to the center of the source exposure rack in waterproof containers or in a diving bell arrangement. The sources will never leave the tank and persons making exposures will be shielded by the water at all times. Readings of less than 2 mr/hr will be maintained at the surface of the tank at all times.

3. The Standing Operating Procedure for the facility is attached on pages 7-4 and 7-5.

Standard Operating Procedures for 125,000 Curie Cobalt 60 Facility

1. All individuals while in the exposure room, will wear film badges, and/or pocket dosimeters and have access to a survey meter when irradiating materials in the facility.

2. Permission and key will be cleared through the supervisor of radiation facilities or his representative before experiment is begun.

3. Exposures will be made as follows:

a. A bridge crane of 6 ton capacity is installed over the tank to handle all the necessary equipment to be lowered into the tank.

b. An aluminum diving bell will be used to expose material to the sources. It measures approximately 30" in diameter x 30" high. An air line attached to the bell keeps the water from entering the bell as it is slowly lowered over the exposure rack by the bridge crane.

c. Material to be exposed will be attached in the diving bell while the bell is suspended on the crane above and to one side of the tank.

d. After the material is in place the diving bell will be swung over the tank, guide rollers will be attached to keep bell in position, and it will be slowly lowered to position over the exposure rack and rest on the platform exposure table at the bottom of the tank. Compressed air will be fed into diving bell at the necessary pressure to keep water from entering the bell as it is lowered to the exposure position.

e. At completion of exposure period diving bell will be raised from tank by bridge crane and removed to a position in the room for removal of exposed material.

f. All safety rules and precautions will be adhered to during all periods of experimentation.

Encl 1

Emergency Procedures

1. If water in storage tank should suddenly start to disappear faster than normal refill can take care of, a firehose will be attached to the 2" pipe provided for that purpose, and from there to the fire hydrant less than 100' away. Water provided from the fire hydrant will keep water at normal level until problem is solved and corrected.

2. If circulating pumps should stop, the pump attached to the emergency storage tank will be used and normal filtering obtained while regular pump is repaired.

3. If emergency storage tank pump should fail while sources are stored for an emergency repair

a. Water will be returned to storage tank via firehose connection to depth necessary to operate regular filter pump.

b. Regular filter pump will be employed until emergency storage tank pump is repaired.

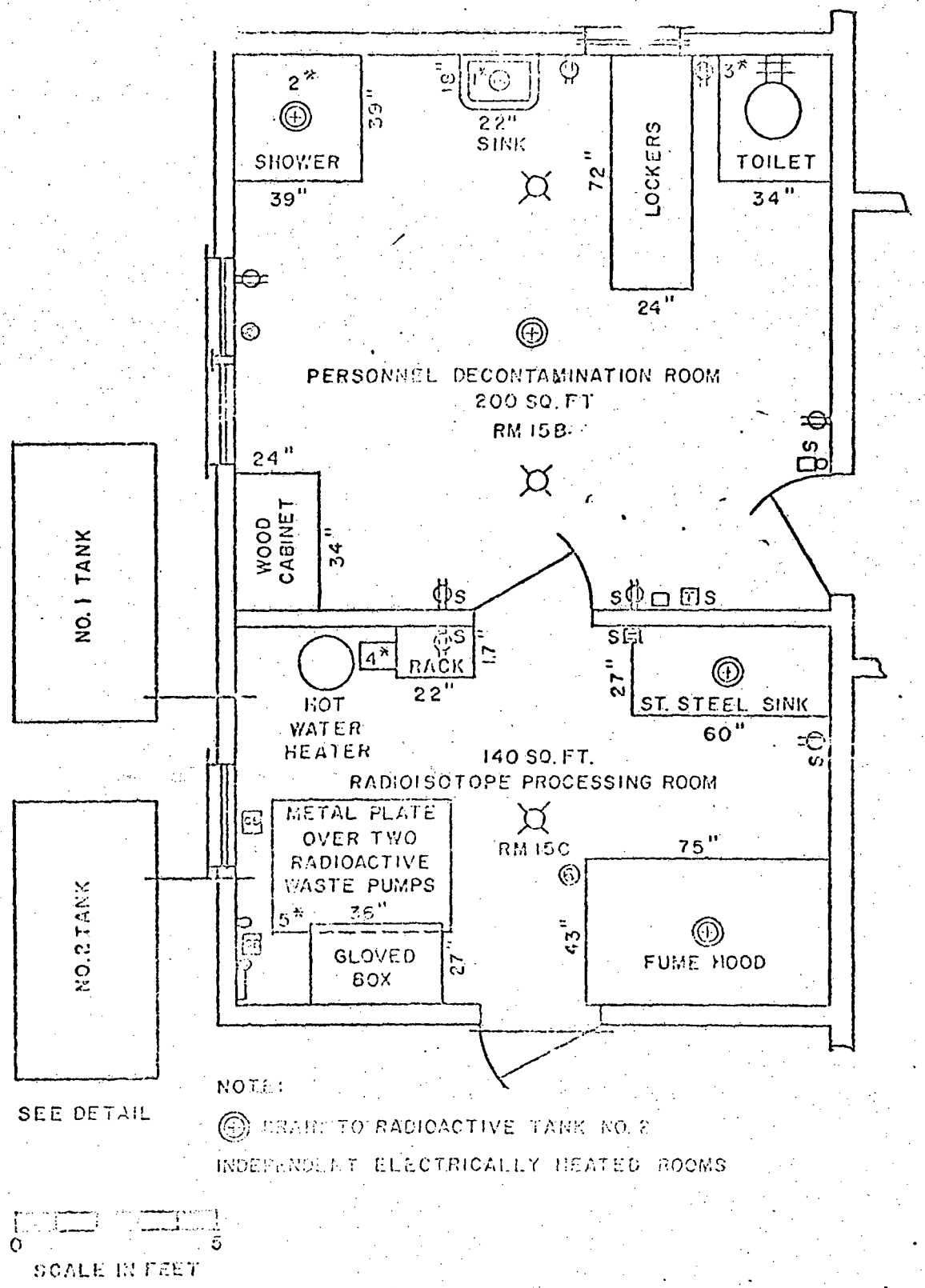
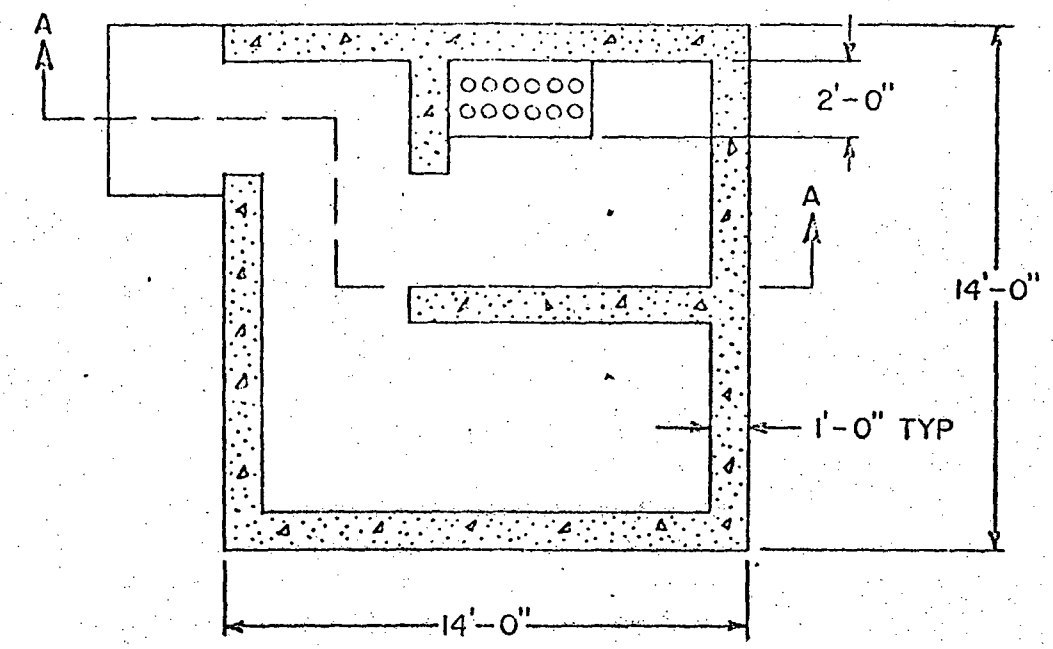
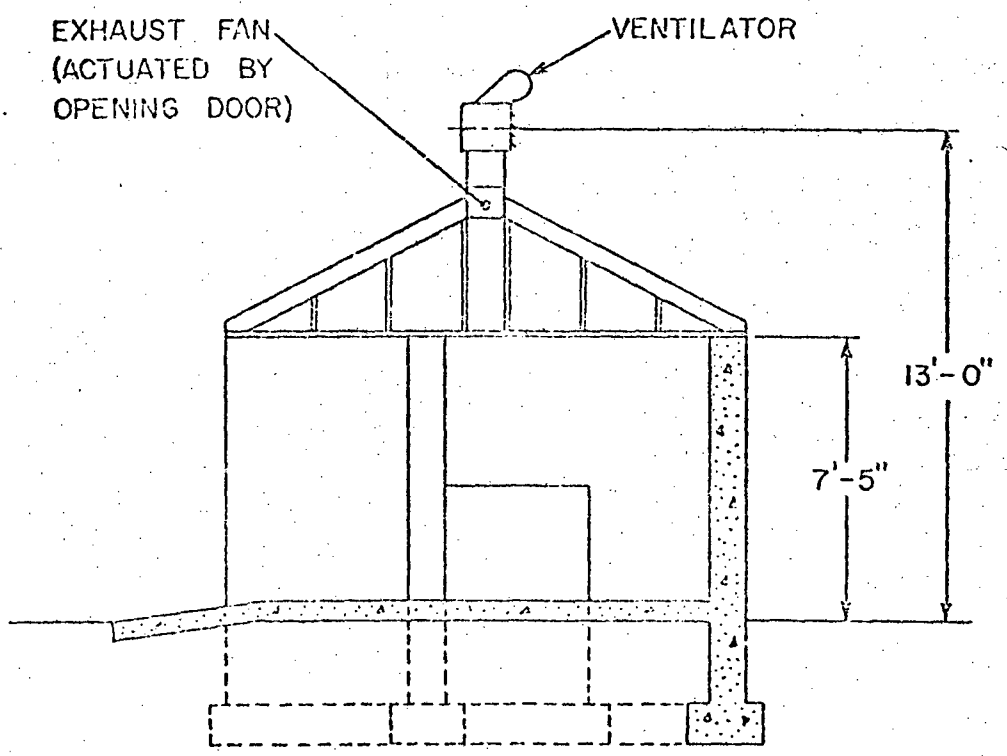


FIG. J-4 DECONTAMINATION AND PROCESSING ROOMS, BLDG S-45, EVANS AREA



FLOOR PLAN



SECTION A-A

FIG. 4-3 BUILDING T-383 RADIOACTIVE STORAGE VAULT, EVANS AREA

INCLOSURE #8

RADIOLOGICAL PROTECTION PROGRAM

AND

LEAK TEST PROCEDURES

Inclosure #8

1. Reference item 14 of NRC Form 313

2. The Radiological Protection Program at the ERADCOM Laboratories is contained in RDE/L POLICY MEMORANDUM Technical No. 1 attached. (Due to reorganization the issuing command may change names, but the directive will remain essentially the same) In addition the following leak test procedure will be used.

3. Leak Test Procedure

A. The water circulating through the filter and deionizing system is monitored constantly to detect any leakage of radiation from the sources in the pool. A remote station monitoring system is used, employing at least two detectors; one is located in the area of the exposure pool and one is located adjacent to the deionizer in the circulatory system. The system also employs an audible alarm and red lights which are activated when the detectors notice any increase in the radiation level.

B. If the detectors show a significant increase in the radiation level the following procedure will be followed to determine the leaking source.

1. The slugs will be separated into containers of 10 sources each.

2. Each container is designed so that the 10 sources contained are isolated from all the others.

a. A special tapered basketed cap containing an inlet and outlet opening with hoses attached is used to seal each container.

b. Neoprene hoses from each cap will run to the top of the large storage tank.

3. After the caps are in place the outlet hose will be attached to a circulating pump (top of tank) and the inlet hose to a container of distilled water.

4. The contaminated water will be pumped out of each container (disposed of in the holding tanks and later diluted to the proper level and emptied into the sewer) and replaced by distilled water. This flushing operation will continue until the containers contain only distilled water.

5. The containers will be allowed to remain in this condition for a period of 2 weeks.

6. After the 2 week period each container in turn will be pumped out. The water will be contained in a special plastic tank large enough to hold the liquid of one container. This plastic container contains a 5" x 5" sodium iodide crystal and a comparable counting system capable of detecting .003 of contamination.

7. Each container in turn will be monitored to determine which one contains the leaking slug.

8. The container showing a contamination greater than .003 uCi will be broken down into containers of 2 slugs each and the above procedure repeated until the leaking slug is identified.

9. When the leaking slug has been found it will be removed from the tank and disposed of in radioactive waste.

a. A lead pig capable of handling the slug safely will be lowered to the bottom of the tank.

b. The contaminated slug will be loaded into the lead pig and sealed with the proper lead cap.

c. The pig will be removed from the tank and stored in Building T-383 (storage vault) until disposed of in radioactive waste.

d. The outside of the container will be decontaminated after removal from the tank and before storing in T-383.

The following persons are authorized to participate in the above leak test: Joseph Crotchfelt, Supervisor, Radiation Facilities

Dr. Stanley Kronenberg, Chief, Nuclear Hardening Technical Area

Michael Davison, Radiological Technician and Alternate RPO

Stanley Potter, Health Physicist and RPO

Resumes of the above personnel at inclosure #1.

DIRECTORATE
RESEARCH, DEVELOPMENT AND ENGINEERING
UNITED STATES ARMY ELECTRONICS COMMAND
FORT MONMOUTH, NEW JERSEY 07703

RDE/L POLICY MEMORANDUM
Technical No. 1

3 June 1977

Expires 3 June 1978

RADIATION PROTECTION

1. POLICY. a. It is the policy of the Director that radiation sources be used in a fashion which will protect personnel from unwarranted radiation exposure.

b. Radiation sources will be used with the understanding that their procurement and utilization shall be in accordance with RD&E Radiation Safety Procedures (copy attached). Any questions concerning the interpretation of procedures will be brought to the attention of the RD&E Radiological Protection Officer (RPO) for assistance and guidance.

2. DISCUSSION. a. These procedures apply to all RD&E organizational units and individuals who procure, possess, use, store, transfer, or dispose of radiation sources, i.e., radioactive material with an activity of one microcurie or greater, and ionizing radiation producing devices.

b. Responsibilities and procedures governing the radiation protection program are described in the inclosure.

3. REFERENCES. a. Code of Federal Regulations, Title 10.

b. AR 40-14.

c. AR 700-52.

d. DARCOM-R 385-25.

e. DARCOM-R 385-29.

f. ECOMR 385-9.

ROBERT S. WISEMAN
Director, Rsch, Dev & Engrg and
Director of Laboratories

E. L. BOWMAN
Colonel, SC
Deputy Director, RDE/L

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RESEARCH, DEVELOPMENT AND ENGINEERING DIRECTORATE

RADIOLOGICAL SAFETY PROCEDURES

RESPONSIBILITIES AND PROCEDURES GOVERNING THE RADIATION PROTECTION PROGRAM WITHIN RD&E ARE DESCRIBED HEREIN. ANY QUESTIONS CONCERNING THE INTERPRETATION OF PROCEDURES SHOULD BE BROUGHT TO THE ATTENTION OF THE RD&E RADIOLOGICAL PROTECTION OFFICER (RPO), TELEPHONE EXTENSION 65292.

95175

CHAPTER 1

Responsibilities

1. The Director of RD&E is responsible for establishing an effective RD&E Radiation Protection Program. For this purpose he will appoint a Radiation Protection Officer to assist him and act in an advisory capacity and coordinate safety policies and procedures among various users of radiation sources.

2. The RD&E Radiation Protection Officer is responsible for:

a. Staff supervision of the Radiation Protection Program including authority to order temporary suspension of hazardous operations.

b. Advising the Director on the degree of hazards associated with ionizing radiation and the effectiveness of measures to control these hazards.

c. Performing inspections to insure compliance with provisions of AEC licenses and applicable Army regulations.

d. Maintaining the RD&E inventory of radiation sources and radioactive materials, including both materials licensed by AEC and those requiring DA authority.

e. Coordinating purchases of radioactive material to assure compliance with AEC licenses or DA authority.

f. Representing RD&E on the ECOM Ionizing Radiation Control Committee.

g. Coordinating submittal of applications for renewal or amendment of AEC licenses and DA authorization and for issuing local permits to use radiation sources.

h. Maintaining a library of current regulations pertinent to the RD&E Radiation Protection Program which will be furnished on request to persons covered by this regulation.

3. The RD&E Safety Officer is responsible for providing assistance and advice on general safety matters in relation to the radiological safety programs.

4. The Chief, Equipment Management Division, RDTSA, is responsible for assuring that all purchases for items containing radioactive material, X-rays, lasers, or other radiation sources have been cleared through the Radiation Protection Officer.

5. The Chief, Equipment Management Division, RDTSA, is also responsible for prompt notification of the RD&E Radiation Protection Officer when radiation sources are received. Items will be picked up by the user after check by the RD&E Radiation Protection Officer.

6. Supervisors in areas where radiation sources are used are responsible for:

a. Insuring that local permits are obtained before any work with radiation sources begins.

b. Insuring that the purchase or use of radiation sources are coordinated with the Radiation Protection Officer.

c. Insuring that all requisitions or contracts requiring radioactive material or other sources of radiation are clearly marked as "documents for procurement of radiation sources" and that these requisitions are coordinated with the Radiation Protection Officer.

d. Providing training of new employees in the safe handling of radiation sources.

7. Workers in areas where radiation sources are used are responsible for strict compliance with procedures approved for the specific application. These procedures and limitations will be contained in the application for a local permit.

CHAPTER 2

Definitions

Accelerator	A device for imparting kinetic energy to charged particles, such as electrons, protons, deuterons and helium ions.
Airborne radioactive material	Any radioactive material dispersed in the air in the form of dusts, fumes, mists, vapors or gases.
Bioassay	The determination of kinds, amounts or concentrations, and locations of radioactive materials in the human body, whether by in vivo counting (whole-body counting, selected organ counting, etc.) or by analysis and evaluation of materials excreted or removed from the human body.
Byproduct materials	Any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the process of producing or utilizing special nuclear material.
Contamination (Radioactive)	Deposition of radioactive material in any place where it is not desired, and particularly in any place where its presence can be harmful. The harm may be in invalidating an experiment or a procedure, or in actually being a source of danger to persons.
Controlled area	A defined area in which the exposure of personnel to ionizing radiation is under the supervision of an individual in charge of radiation protection.
Decay, Radioactive	The disintegration of the nucleus of an unstable nuclide by the spontaneous emission of charged particles and/or photons.

Decontamination Factor	The ratio of the amount of undesired radioactive material initially present to the amount remaining after a suitable processing step has been completed. A factor referring to the reduction of the gross measurable radioactivity.
Dose (Dosage)	The radiation delivered to a specified area or volume or to the whole body. The dose may be specified in air, or the skin, or at some depth below the surface, but no statement of dose is complete without specification of location.
Dose Equivalent (DE)	This is the product of absorbed dose (D), quality factor (QF), and other factors needed to achieve the common exposure scale referred to under the definition of Quality Factor. It is commonly expressed in rems.
Dose Rate	Radiation dose delivered per unit time.
Dosimeter	An instrument used to detect and measure an accumulated dose of radiation.
Dpm	Disintegrations per minute.
Gamma Ray	Electromagnetic radiation emitted by a nucleus as a result of a transition between two nuclear energy levels. Gamma rays have high energies with correspondingly short wavelengths and their ability to penetrate matter is high.
Health Physics	A term in common use for that branch of radiological science dealing with the protection of personnel from harmful effects of ionizing radiation.
High radiation area	Any area, accessible to personnel, in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose equivalent in excess of 100 millirem.

Ionizing Radiation	Any electromagnetic or particulate radiation capable of producing ions, directly or indirectly, in its passage through matter.
Ionizing Radiation Producing Devices	Electronic devices which are capable of generating ionizing radiation such as x-ray machines, linear accelerators, cyclotrons, radio frequency generators which use klystrons, magnetrons, or other tubes which produce x-rays, and electron microscopes.
Isotope	One or more nuclides having the same atomic number but a different mass. Isotopes of a substance have almost identical chemical properties.
Monitoring	Periodic or continuous determination of the amount of ionizing radiation or radioactive contamination present in an occupied region. Also called surveying.
MPC	Maximum permissible concentration(s).
mRad	Millirad
mRem	Millirem
Neutron	An elementary uncharged nuclear particle which has a mass equal to that of a hydrogen atom.
Photon	A quantity of electromagnetic energy whose value in ergs is the product of its frequency in hertz and Planck's constant.
Planck's Constant	A natural constant of proportionality (h) relating the frequency of a quantum of energy to the total energy of the quantum. $h=6.624 \times 10^{-34}$ joules-sec.
Positron	A particle equal in mass to the electron and having an equal but positive charge.

Quality Factor (QF)	This is the linear-energy-transfer-dependent factor by which absorbed doses are to be multiplied to obtain, for purposes of radiation protection, a quantity that expresses on a common scale for all ionizing radiations, the effectiveness of the absorbed dose.
Radiation	Energy propagated through space. As used in this regulation, the term refers to two kinds of ionizing radiation: 1. Electromagnetic waves (x-rays, gamma rays) and 2. Corpuscular emissions from radioactive substances or other sources (alpha and beta particles). Ionizing radiation is any electromagnetic or particulate radiation capable of producing ions, directly or indirectly, in its passage through matter.
Radiation Absorbed Dose (Rad)	The amount of dose imparted to matter by ionizing radiation per unit mass of irradiated material. The unit of absorbed dose, the Rad, is equivalent to 10^{-5} Joules/gm.
Radiation Area	Any area accessible to personnel in which there exists radiation at such levels that a major portion of the body could receive in any one hour a dose equivalent in excess of 2 millirem or in any five consecutive days a dose equivalent in excess of 100 millirem.
Radiation Hazard	A condition under which persons might receive radiation in excess of the applicable maximum permissible dose, or where radiation damage might be caused to materials or personnel.
Radiation Sources	Materials or devices which generate or are capable of generating ionizing radiation, including naturally occurring radioactive material, by-product materials, source materials, special nuclear materials, fission products, materials containing induced or deposited radioactivity, radiographic and fluoroscopic equipment, particle generators and accelerators, and

	electronic equipment which utilizes klystrons, magnetrons, or other electron tubes which produce x-rays.
Radiation Work Permit	A locally developed form which is completed prior to the start of any work that is to be performed in a controlled area and describes the potential radiation hazards and protective equipment requirements for a given job. It should also provide a running record of radiation exposures received during a given job.
Radioactivity	Process whereby certain nuclides undergo spontaneous disintegration, liberating energy through the emission of alpha or beta particles or gamma photons or a combination of these.
Radiological Survey	Evaluation of the radiation hazard incident to the production, use, or existence of radioactive materials or other sources of radiation under a specific set of conditions.
Radiological Protection Officer (RPO)	An individual designated by the commander to provide consultation and advice on the degree of hazards associated with radiation and the effectiveness of measures to control these hazards. In addition, he is tasked with the supervision of the Radiation Protection Program. This individual will be technically qualified by virtue of education, training, and professional experience, to assure a capability commensurate with the assignment. (The term "Radiological Protection Officer" is not intended to denote a commissioned status.)
Restricted area	Any area to which access is controlled for purposes of protection of individuals from exposure to radiation and radioactive materials.

Roentgen	The quantity of X or gamma radiation such that the associated corpuscular emission per 0.001293 gram of air (1cc of dry air at standard conditions) produces, in air, ions carrying one electrostatic unit or quantity of electricity of either sign. This is the special unit of exposure.
Roentgen Equivalent Man (REM)	This is the unit of dose equivalent (DE) and is commonly referred to as the roentgen equivalent mammal.
Special Work Permit	A permit to assure that no work will commence in areas where radiation is greater than 20 mrem/hr until each job has been properly evaluated from a radiological standpoint and has been approved by Health Physics personnel.
User	An individual assigned to an activity, section, division, or other organizational unit which has been delegated the responsibility for the use, operation, or storage of radiation sources.
X-ray	Penetrating electromagnetic radiation having wavelengths shorter than those of visible light. X-rays are similar to gamma rays, but are originating in the extra-nuclear origin.

CHAPTER 3

EXPOSURE GUIDES

1. Regulations. Requirements as set forth in Title 10, Parts 19 and 20, Code of Federal Regulations, and AR 40-14 for the Control of Occupational Exposure to Ionizing Radiation, will be followed. Recommendations in the National Bureau of Standards Handbooks on Radiation will be used in addition.

2. Exposure of individuals in controlled areas. a. A controlled area is any area in which the exposure of personnel to radiation or radioactive materials is under the supervision of a radiation protection officer. Every effort will be made to maintain radiation doses as low as possible. Avoid all unnecessary exposure to ionizing radiation. Radiation protection standards for the control of occupational exposures to ionizing radiations include the following:

(1) The accumulated dose of radiation to the whole body, head and trunk, active blood-forming organs, gonads, or lens of the eye shall not exceed:

(a) 1.25 rem in any calendar quarter, nor

(b) 5 rem in any one calendar year, nor

(c) 5(N-18) rem total lifetime dose, where N equals the present age in years.

(2) The accumulated dose of radiation to the skin of the whole body, forearms, or the cornea of the eye shall not exceed:

(a) 7.5 rem in any calendar quarter, nor

(b) 30 rem in any calendar year.

(3) The accumulated dose of radiation to the hands and wrists or the feet and ankles shall not exceed:

(a) 18.75 rem in any calendar quarter, nor

(b) 75 rem in any calendar year.

b. Personnel not occupationally exposed, and persons who are less than 19 years of age will not be exposed in any calendar quarter in excess of 0.125 rem or in excess of 0.50 rem in any calendar year. Pregnant women will not be exposed to occupational doses or ionizing radiation. When a female employee becomes aware of her pregnancy, she will request that her duties be changed to eliminate all occupational exposure to ionizing radiation.

c. Occupational exposure to radioactive concentrations in air or water may not exceed the limits set forth in Title 10, Part 20 of the Code of Federal Regulations.

3. Exposure of individuals in uncontrolled areas. Radioactive materials and other sources of ionizing radiation will not be possessed, used, or transferred in such a manner as to create in an uncontrolled area radiation levels which, if an individual were continuously present in the area, could result in his receiving a dose in excess of 0.5 rem in one calendar year.

4. Limits for contamination. When hands, body surfaces, clothing or shoes become unavoidably contaminated, steps will be taken as soon as possible to remove loose contamination. Decontaminate hands and body surfaces until no detectable activity above background is observed. Some degree of fixed contamination in certain cases cannot be avoided and the following maximum limits are recommended for personal clothing and shoes (see Chapter 6, Table 1):

Alpha activity - 200 disintegrations per minute per 100 square centimeters of area.

Beta-gamma activity - 0.2 millirad per hour at one centimeter.

5. Concentrations of radioactive contamination surfaces. a. Loose contamination on exposed surfaces such as bench tops and floors will be removed as soon as possible. Small amounts of fixed contamination will be unavoidable at times, but the degree of such contamination should be kept as low as practicable. Maximum limits of fixed contamination of 1000 dpm per 100 cm^2 of alpha and 2 mrad/hr at 1 cm of beta-gamma are recommended for controlled areas. Amounts of contamination in excess of the above limits will not be permitted to remain on exposed surfaces without approval of the RPO. Higher levels of contamination may be permitted for restricted surfaces, that is in areas where entry or access is controlled by procedures or special work instructions. The same standards of contamination control shall apply to tools and equipment. In all cases, signs and controls for contaminated surfaces, areas, or equipment will be instituted to the extent necessary to prevent the occurrence of a health hazard or the spread of contamination. In no case will the levels result in exposure to individuals in excess of the established limits. Any material or equipment so contaminated will be properly labeled with a contamination tag giving:

(1) Type and level of radiation (mrad/hr) at a specified distance.

(2) Extent of contamination on surfaces.

b. No contaminated equipment or material may be removed from any area without prior notification and approval of the RPO. Any equipment or material to be maintained or handled in a clear area must be decontaminated according to the requirements set forth in Chapter 6, paragraph 6, Table 1.

6. Radiation protection controls governing beta-gamma exposure. The following limits will be observed:

a. No individual without a special work permit will be permitted to work in a radiation control area where exposure levels are greater than 20 mrem/hr.

b. Any radiation area where exposure levels are greater than 100 mrem/hr shall be classified as a high-radiation area. An accurate exposure record will be maintained for each individual required to work in a high-radiation area. Based on pencil dosimeter reading, the record will contain the total cumulative exposure of the individual during the life of the special work permit.

c. The time during which any individual is exposed will be controlled so that exposure limits will not be exceeded.

7. Radiation protection controls governing alpha exposure. External exposure to alpha radiation is negligible, since the range of the alpha particles is less than the thickness of the layer of dead skin. Fume hoods will be used in conjunction with the long-lived alpha-emitting substances or other substances presenting a similar health hazard. In handling an unsealed alpha source, gloves or forceps afford adequate protection. Sealed alpha-neutron sources must be carefully handled to protect the integrity of the seal and prevent the spread of contamination. The prime hazard to consider is personnel contamination and the danger of ingestion or inhalation of airborne contamination. Fume hoods should have an absolute filter. The linear flow rate should be at least 100 ft/min. Airborne contamination levels will be determined as set forth in Chapter 6, paragraph 6.

CHAPTER 4

Local Permits

1. Local permits for the use of radiation sources are required. Applications for permission to use or store radioactive materials or sources of ionizing radiation will be submitted to the RD&E Radiation Protection Officer, DRSEL-RD-H.

2. Radioactive sources. Local permits for the use of radioactive materials will be issued only when an approved AEC license or DA authorization is available. Contractors will be issued a local permit based on an approved DA permit.

3. Application for local permits. The local permit must be obtained before procurement of the particular item(s). Each organization desiring to use a radiation source in RD&E will apply for a permit. Application will be on DF addressed to RD&E Radiation Protection Officer, DRSEL-RD-H, and will include the following information:

a. Organization.

b. User personnel and qualifications (include training and experience).

c. Type of radiation source.

d. Physical form of the radioactive material.

e. Number of sources required.

f. Quantity of radioactive material or power of radiation source.

g. Planned use of radiation source.

h. Radiation protection equipment.

i. Facilities where radiation source will be used.

j. Radiation protection program (SOP).

Special Work Permit

An application for a special work permit must be submitted to the RD&E RPO before working in any area with radiation levels greater than 20 mrem/hr when authorization has not been otherwise obtained.

Radiation Work Permit (RWP)

Upon request from radiation area supervisors, a radiation work permit will be issued by health physics personnel for work when unusual working conditions are required as prescribed by the RD&E RPO. (See Incl 1 for sample RWP.)

CHAPTER 5

Procuring, Shipping and Receiving of Radiation Sources

1. Procurement. All requisitions or contracts for items that contain radioactive materials will be coordinated with the Radiation Protection Officer of RD&E. Each request for radiation sources will include a covering DF stating the need for the material and citing the local radiation permit where the sources will be used. Procurement of radioactive materials will not be initiated until proper coverage under an AEC license or DA authorization is issued.

2. Shipping. a. The user is responsible for the proper packaging and labeling of radioactive materials for shipping. The user will initiate DA Form 2791-R which will then be completed by the Radiation Protection Officer.

b. The user will provide the RD&E Radiation Protection Officer with the AEC license or DA authorization of the person who will receive the radioactive material.

3. Receiving. a. The RD&E Radiation Protection Officer will check all radioactive material when it arrives. He will complete all necessary shipping paperwork, then notify the user to pick up the radioactive material. Radioactive materials will not be transported in privately owned vehicles.

b. Upon receipt of radioactive material, the Radiation Protection Officer will perform a leak test, when required, and notify the user of the results of the leak test.

CHAPTER 6

Prevention of Radiation Hazards

1. Method. a. This appendix contains information on the prevention of radiation hazards and special precautions necessary to safely work with radioactive materials. The three methods of radiation hazard prevention are: Mechanical and chemical, medical, and monitoring. All personnel required to work in radiation hazard areas will be informed as to the function and use of each method.

b. Some methods of radiation hazard prevention involve the proper use of fire extinguishers, roping off and posting of areas, permanent and portable shielding, and the use of area-monitoring instrumentation.

c. Another method of radiation hazard prevention includes the protection of personnel by wearing some or all of the following items, depending on the type of work: Disposable clothing, coveralls, plastic aprons, gloves, plastic shoe covers, and/or boots.

d. Decontamination materials include such things as the chemicals used to decontaminate personnel and laboratory equipment, waste containers, swabs or Kemwipes, and paper - both absorptive and non-absorptive.

e. Prevention of radiation hazards is effected by the establishment of restricted areas, time limits for stay in danger zones, and the requirements to comply with exposure limits and other rules.

2. Procedures. a. Mechanical and chemical. (1) Film badge service will be initiated or discontinued by request to the RD&E RPO. An adequate supply of film badges will always be available for immediate use. Staff members who escort visitors to radiation areas are responsible for signing badges in and out for their visitors.

(2) Each person assigned a film badge will wear only the particular badge number assigned to him. Under no circumstances will badges be exchanged with another person. Film packs should never be removed from the badge or tampered with in any way.

(3) Personnel working in radiation areas must wear badges at all times while they are in such areas. These badges may be worn comfortably on the belt line or chest but they must never be covered by any other clothing or carried in pockets.

(4) All film badges will be kept in the assigned badge rack at the end of the work period. They will not be taken out of the building unless the outside specific duty or travel will be associated with an exposure to radiation.

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(5) Film badges will be collected for exchange of film each month on the day specified on the assigned badge rack.

(6) Pocket dosimeters will be recharged as required. Additional pocket dosimeter will be maintained for visitors or persons whose routine does not require a permanently assigned film badge. These dosimeters will be signed for in a log, the dose will be recorded, and a notation will be made that the person wearing it was a visitor.

(7) All persons entering radiation areas will wear a dosimeter. People who are unfamiliar with the facility will be accompanied by responsible personnel acquainted with the facility.

(8) Fire extinguishers will be placed in conspicuous places in radiation areas and clearly marked. They will be periodically checked and maintained by the Area Fire Captain. Any extinguisher that is used will not be returned to its rack but will be reported to the Fire Captain as soon as possible. All personnel will familiarize themselves with the location and use of these extinguishers throughout the building so that in the event of an emergency they will be brought into use as soon as possible.

(9) Radiation signs and tags are posted for the safety of every employee and must be respected. The RD&E Radiological Protection Officer will post and remove radiation warning signs. When radiation levels exceed permissible levels, the area will be posted with appropriate signs. These signs will indicate the nature of the radiation and/or contamination, the date of posting, the radiation level at a specified distance, and any other appropriate data.

b. Medical. (1) Each person working with radiation will be required to undergo a complete medical examination at the start of employment and at one-year intervals thereafter. This initial examination will include a complete medical history and physical examination. The history will include a notation of previous work with ionizing radiation. A copy of each medical record will be kept on file by the preventative-medicine facility. The entering examination will include a complete blood count, urinalysis, and a chest x-ray.

(2) Special checkups will be made at any time as determined necessary by the RD&E Radiation Protection Officer and/or Preventive Medicine Officer.

c. Monitoring. (1) Personnel monitoring will be accomplished by the use of film badges and dosimeters with resulting data recorded. Special monitoring due to exposure or contamination may be required. Cases of overexposure or contamination may require a special medical checkup.

(2) When an individual has received a dose of ionizing radiation in an amount exceeding 1.25 rem per calendar quarter, he will be removed from duties involving occupational exposure to ionizing radiation until subsequent exposure limitations are established in consultation with competent medical authority. When an individual has received an accumulated dose of ionizing radiation in excess of 5(N-18) rem, he will be removed from duties involving occupational exposure to ionizing radiation until his exposure record has been evaluated by the Surgeon General of the Army and subsequent exposure limitations are established as necessary.

(3) The frequency of area monitoring will depend upon the radiation levels of the usual work in the area, the frequency of the use of the area and other conditions specific for each area. The radiation area supervisor will assure radiation levels are determined prior to working in a radiation control area, on a daily basis.

(4) The general radiation background in the area will be first recorded. Successive readings in representative work areas will be taken and noted. If any locations are noted where the dose rate is greater than the maximum permissible, the area will be posted immediately. Where additional shielding will correct the situation, this will be done as soon as possible.

(5) As each area is surveyed, a check will be made to detect any existing or potential hazard and to rectify it.

(6) Special surveys will be made by the RD&E RPO at any time upon specific request of an individual or before unrestricted entry is permitted to a previously contaminated area.

(7) Sufficient instrumentation is available to the RD&E RPO to properly support all special radiation surveys. All instrumentation used for radiation protection will be calibrated at least every three (3) months, and after each maintenance or battery change. Dosimeters will be calibrated at least every six (6) months.

3. Periodic checkups. a. From time to time, inspections will be made to insure that personnel are complying with procedures in radiation areas. Periodic checks will also insure that any modifications to the basic operating procedures are being followed correctly so as to minimize radiation hazards.

b. Constant inspections are necessary to avoid a dulled alertness on the part of personnel. It cannot be overemphasized that while working with radiation can be safe, mistakes may be very dangerous and possibly fatal. The checkups are for the safety of personnel.

c. The efficiency of all warning devices will be determined at intervals not greater than one month; this is in addition to the complete maintenance check which will be made at any time on all locks, etc. If at any time there is a failure in any remote monitors, work will be halted immediately and the approval of the RD&E Radiation Protection Officer will be required before normal operating procedure is resumed.

4. Access to radiation areas. a. Access to areas where there is a potential radiation hazard will be limited to minimum personnel required to safely, efficiently, and most readily carry out the required procedures. All persons entering an area classified as a Radiation Control Area or a High Radiation Area must wear a film badge. A pocket dosimeter may also be required in certain areas. All visitors to radiation areas are required to be accompanied by personnel assigned to the area. A "visitor" is considered to be anyone not directly connected with the work being conducted.

b. Anyone discovering an area of hazardous radiation will evacuate the area and call the RD&E RPO who will accurately survey the area and post it. Only the RPO has the authority to remove any signs once they are posted.

5. Radiation hazard signs. These signs are in the form of labels, tags, and signs for posting areas and equipment and identifying radiation areas and items which may be radioactive or contaminated. They incorporate the standard magenta and yellow color, the three bladed radiation symbol, and appropriate wording, such as "Caution," "Danger," "Contamination," "Radiation Area," and "High Radiation Area." Where such signs and tags are used, additional information may be added to them by the RPO to further identify the nature of the hazard. The information will contain the nature of the substance causing the hazard, its dose rate at a specified distance, the date, and other pertinent information.

6. Decontamination and waste disposal. a. In order to prevent the possibility of contamination, the following regulations will be observed:

(1) There will be no smoking, drinking, or eating in radiation control areas.

(2) In cases of skin contamination, no eating, smoking or application of cosmetics will be permitted until all removable radioactivity has been taken from the skin and the person is released by the RPO.

(3) Organic solvents, highly alkaline soaps, or abrasives should not be used for decontamination at any time, since they increase the possibility of skin injury and serious contamination. Levels of radiation beyond which areas are considered to be contaminated radiation areas are outlined in Chapter 3. Any incident or accident which causes an area to be contaminated must be reported immediately to the RPO. The use of any decontaminates other than mild soap and water should only be done under the supervision of medical personnel.

b. The RPO will be responsible for establishing procedures controlling the spread of contamination. These procedures will include emergency ventilation control, controlled step-off areas, controlled passageways, personnel monitoring, decontamination procedures, etc.

c. All persons selected by the RPO to work on monitoring and decontamination will be equipped with protective clothing, suitable gloves and other equipment required by the level of work.

d. In the event of airborne contamination the RPO will determine through the use of fixed or portable air sampling monitors the extent of the contamination. The RPO will specify the maximum levels for personnel access to airborne contamination areas. These limits will not exceed:

For Personnel Wearing	Alpha Concentrations	Beta Concentrations
No respiratory protection	< 1 MPC*	< 1 MPC*
M-17 Full face respirator	50 MPC*	50 MPC*
Supplied air or self-contained air supply with full face mask	50 MPC*	50 MPC*

*Maximum permissible concentration

e. When there is a possibility of contamination or radiation hazard, all ducts and vents leading from the building, whether they are for water, air, gas, or electrical conduit, will be marked so that maintenance or repairmen will be aware of the potential hazard. Where these tags exist, the RPO will be notified to survey the area before any work is started. If the need for shielding is indicated by monitoring procedures, the supervisor or the project leader will provide the shields before work in this area can resume.

f. Personnel decontamination methods depend upon the nature of the contaminating material and the size of contaminated skin area. No detectable contamination level above background is allowed to remain on hands or skin after decontamination. The following procedures will be used immediately:

(1) First notify the RPO. All materials needed for decontamination will be furnished by the RPO and will be located where they will be most convenient for use.

(2) Thorough washing with soap and water and rinsing with large quantities of water is the best general decontamination method for the hands and other parts of the body, regardless of the nature of the radioactive contaminant. If, however, the contamination is well localized,

it is recommended that the area be cleaned immediately with small swabs and later, if necessary, by a general washing. Spread of contamination to other skin areas is thus avoided.

g. If the contamination is widespread, a general washing or shower should be taken and other more specific measures outlined below should be followed under medical supervision and the RPO.

(1) For general washing: Wash the hands for two to three minutes in tepid water using a mild soap, with special attention to finger folds, outer edges of the hands and fingernails. Rinse thoroughly and repeat a maximum of four times. If the required degree of decontamination is not reached, proceed with step (2).

(2) Using a soft brush, wash and rinse contaminated areas three times in eight minutes of which no less than six minutes are spent in scrubbing. Use pressure light enough not to abrade the skin. Rinse thoroughly and monitor. If the desired level is not reached after several trials, chemical decontamination may be attempted as outlined in step (3).

(3) Apply a paste of titanium dioxide liberally and work it in over the contaminated areas for a minimum of two minutes. Use water sparingly, only enough to keep the paste moist. Rinse with warm water and follow with soap, brush and water, being extremely cautious to remove all paste about the nails. Monitor. Repeat process if necessary. If three successive trials fail to remove all contamination to the prescribed level, follow step (4). Note: Do not use near face or other body openings.

(4) Daub over the contaminated area a saturated solution of potassium permanganate for not more than two minutes. Wash with soap and water and rinse. Next, apply a solution of sodium bisulfite to remove the dark permanganate stain. The procedure may be repeated but since the permanganate is caustic to the skin, care should be taken to follow the prescribed times closely. Hand cream should be used as a final step to prevent chapping. Note: Do not use near face or other body openings.

h. Persons with cuts or wounds will not be permitted to work in a contaminated area or radioisotope laboratory unless specific approval is obtained from the RPO. Any wounds, cuts or abrasions received while working with, in, or near radioactive materials should be flushed with water immediately. Any such accidents should be referred to the RPO immediately so that specific measures can be taken.

i. The RPO will assist in and monitor the decontamination of materials and equipment. He will supervise the disposal of radioactive waste and other work connected with radiation hazards.

j. In the event of contaminated clothing, the contaminated articles will be removed immediately. Skin areas underneath the clothing will be cleansed as soon as possible and the contaminated clothing placed in plastic bag so that it may be properly laundered and recovered.

k. In order to prevent the gross contamination of laundered items, two separate laundry systems are employed. All contaminated laundry generated in radiation areas is laundered in a specially equipped laundry.

l. Contaminated materials will be disposed of in suitable dry active waste or liquid active waste containers. At no time should dry active and liquid active wastes be mixed. When containers for radioactive wastes are full, the RPO will supervise the removal. All radioactive waste containers will be stored in the radioactive storage vault.

m. The RPO will aid in the problem of evaluating contaminated equipment. If it is not practical to decontaminate the equipment, it will be handled as dry active waste. In some cases, it may be possible to store such equipment for future use when radiation levels have decayed to acceptable levels. Equipment properly marked and shielded will be stored in the radiation storage vault.

n. The following methods can be used to decontaminate equipment; the decision as to the actual and most practical method will be determined by the RPO.

(1) Equipment may be washed with a hot, strong detergent solution, rinsed, and procedure repeated until the desired decontamination is reached. Chemicals that may be used include chromic acid, nitric acid, ammonium citrate, trisodium phosphate, and ammonium bifluoride. In selecting decontamination materials, the nature of the surface and extent of contamination must be considered. For all practical purposes, decontamination effectiveness of a solution is considered complete at the end of the second repetition of any one process. If the desired level is not reached at this time, other methods should be considered.

(2) Before any decontaminated equipment or articles can be moved or transported to a "clean area" the RPO will determine the extent of contamination of the particular item. Limits of contamination for items to be admitted to a clean area on the basis of 100 cm^2 area are as follows:

Loose contamination detectable by smear

Alpha (DPM)	50
Beta-Gamma (DPM)	100

Maximum fixed contamination

Alpha (DPM)	200
Beta-Gamma (m Rad/hr)	0.25

In the case of area contamination, the method of decontamination will depend upon the nature of the surface. These methods are vacuuming, physical removal of surfaces, covering of short-lived materials with impervious materials, detergents, and chemicals. When practical, areas which are contaminated will be isolated until radioactive decay permits safe entry.

o. All areas which are contaminated by accidents or spills will be evacuated immediately. If certain safety precautions can be instituted (such as placing absorbent paper on a spill to prevent spread of the contaminant) without endangering one's safety before leaving, it should be done. The RPO will monitor the contaminated area and determine the most practical methods of decontamination.

p. Maximum permissible contamination levels are listed in Table 1.

Table 1. Maximum permissible c[illegible]mination on inanimate objects.

Item and Corrective Action	Fixed (F) or Removable (R)	CONTAMINATION LEVEL: Alpha dpm/100 cm^2 Instrument	Alpha dpm/100 cm^2 Smear	Beta-Gamma mrad/hr at 1 in.	Beta-Gamma dpm/100 cm^2
1. Personal clothing, including shoes. Replace, decontaminate or store for decay, if above:	F	200		0.2	
	R		None		None
2. Protective clothing, incl. choes.					
a. General. Should be replaced or decontaminated, if above:	F	1,000		0.5	
	R		200		1,000
b. Laundry. Do not release to public laundry, if above:	F	200		0.4	
	R		50		200
c. Respirators	F	200		0.06	
	R		None		None
3. Laboratories and work areas:					
a. Uncontrolled areas. Require controls and posting or decontaminate, if above:	F	200		0.25	
	R		30		100
b. Controlled areas. Decontaminate, or if impossible, fix with periodic check on fixation, if above:	F	1,000		2.0	
	R		200		1,000
4. Vehicles:					
a. Use in controlled areas. Decontaminate or if impossible, fix, if above:	F	1,000		2.0	
	R		300		1,000
b. Use in uncontrolled areas. Decontaminate, if above:	F	500		0.4	
	R		30		500
5. Tools, equipment and containers. Prior to non-radioactive use, decon if above:	F	200		0.25	
	R		50		100
6. Shipping containers, outside surfaces, decon if above:	F	500		0.25	
	R		None		None

CHAPTER 7

Emergency Procedures for Radiation Accidents

1. Emergency procedures will be instituted at the time of a radiation accident or contamination event or whenever safe levels prescribed in Chapter 3 are exceeded.

2. Emergency procedures in case of contamination. a. An individual's first responsibility is for his own safety and for the safety of other individuals in the immediate area. Loss or damage of materials and equipment under emergency conditions is a secondary consideration. Immediate measures for the prevention of spread of contamination, such as dropping absorbent material on spilled liquids, should be carried out only if they can be completed safely. Once an individual has left an emergency area, he may not return without permission from and under the supervision of the RPO.

b. The room or area will be vacated immediately. Where radioactive materials are released, persons in the area should hold their breaths to avoid inhalation of the materials.

c. The contaminated area will be isolated as quickly as possible and each entrance or exit to the area marked with a warning sign indicating the hazard.

d. If any material comes in contact with the clothes or body:

(1) Clothing will be discarded in a suitable container. Under no circumstances should the clothing be so carelessly handled as to spread the contamination further.

(2) Contaminated skin areas will be decontaminated as quickly as possible using methods outlined in Appendix F, paragraph 6. Any contaminated cuts or abrasions should be flushed immediately with huge quantities of water.

(3) All other persons who were working in the vicinity of a contaminated area will be monitored by the RPO.

e. The RPO and the area supervisor will be notified immediately and no area decontamination procedures should be started until the situation is evaluated by the RPO.

3. Fires and other major emergencies. a. The first person to discover the emergency will:

(1) Notify all persons not directly involved with the incident who are in the area.

(2) Notify the fire department and other emergency personnel.

(3) Attempt extinguishment of fires using readily available first-aid type extinguishers if a radiation hazard is not immediately present. Efforts should be made to prevent water or fire fighting chemicals from coming in contact with the radiation source. Attempt to control runoff, preventing it from entering sewers or drainage systems until it has been monitored.

(4) Notify the RD&E RPO.

b. the RPO will:

(1) Advise and assist the emergency personnel.

(2) Following the emergency, monitor the area and determine the protective devices necessary for safe decontamination.

(3) Supervise decontamination.

(4) Monitor all persons who were in the emergency area and those who were involved in combating the emergency.

(5) Monitor downwind, delineate all contaminated areas, and restrict access as necessary.

RADIATION WORK PERMIT

RWP Serial Number_____

te:_____Page_____of_____Pages

Location:_____

_____

Time Approved:_____

Time Started Work:_____

Description of Job:_____

_____

_____

_____

Survey Measurements:_____

_____

_____

ntamination Control Point_____Yes_____No

Approval to Start Work:

Protective Equipment Required

Lab Coat	_____
Overalls	_____
Rubbers	_____
Booties	_____
Rubber Gloves	_____
Hoods	_____
Surgeons Cap	_____
Eye Protection	_____
Assualt Mask	_____
Fresh Air Mask	_____
Other	_____

Monitoring Required:_____

_____

_____

Area Supervisor:_____

Health Physics:_____

Duration of RWP

_____

Permit Terminated By:_____
(Signature) (Date) (Time)

Reason: Completion ( ) Cancellation ( )
Changed Conditions ( )

TIME RECORD

*Name	Film Badge Number	Dosimeter Number	Reading In/Out	Time In/Out	Total Time	Dosage Rec'd M/R

*Indicates understanding and compliance.

Incl 1

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