FORM NRC-313 I (1-79) 10 CFR 30 — U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE
INDUSTRIAL

See attached instructions for details.

Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.

1. APPLICATION FOR: *(Check and/or complete as appropriate)*

	a. NEW LICENSE
	b. AMENDMENT TO: LICENSE NUMBER
X	c. RENEWAL OF: LICENSE NUMBER 08-01738-03

2. APPLICANT'S NAME *(Institution, firm, person, etc.)*
Walter Reed Army Medical Center
Washington, DC 20307-5001
TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
202-576-1100

3. NAME OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION
LTC William E. Woodward
Health Physics Officer, WRAMC
TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
301-427-5104

4. APPLICANT'S MAILING ADDRESS *(Include Zip Code)*
Commander
Walter Reed Army Medical Center
ATTN: HSWP-QHP
Washington, D.C. 20307-5001

5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED *(Include Zip Code)*
Walter Reed Army Institute of Research, Washington, DC 20307-5001 & US Army Medical Research Institute for Infectious Diseases, Ft Detrick, Frederick, MD 21701

(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)

6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL
(See Items 16 and 17 for required training and experience of each individual named below)

	FULL NAME	TITLE
a.	Individuals approved by the Radiation Control Committee, Walter Reed Army Medical Center	
b.		
c.		

7. RADIATION PROTECTION OFFICER
LTC William E. Woodward - Ref: AR 40-14 & AR 40-37, the Health Physics Officer will be appointed by the Commanding General, WRAMC.

Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.

8. LICENSED MATERIAL

LINE NO.	A ELEMENT AND MASS NUMBER	B CHEMICAL AND/OR PHYSICAL FORM	C NAME OF MANUFACTURER AND MODEL NUMBER *(If Sealed Source)*	D MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME
(1)	Cobalt-60	Sealed Source	AECL, Model C-166, C-167 or C-198	Max. total Ci: 16,000 Max. Ci/source:16,000
(2)	Cesium-137	Sealed Source	AECL, Model C-161-Type 8	Max. Total Ci: 4,000 Max. Ci/source:2,100
(3)	Cobalt-60	Sealed Source	AECL, Model C-198	Max. total Ci: 26,400 Max. Ci/source:26,400
(4)	Cesium-137	Sealed Source	AECL, Model C-161-Type 8	Max. total Ci:4,2000 Max. Ci/source: 2,100

	E DESCRIBE USE OF LICENSED MATERIAL
(1)	To be used in AECL Gammacell 220 irradiator located at WRAIR, Washington, DC for medical research and development and radiation dosimetry.
(2)	To be used in AECL Gammacell 40 Irradiator located at WRAIR, Washington, DC for small animal irradiation, medical research, development and radiation dosimetry
(3)	To be used in AECL Gammacell 220 Irradiator located at USAMRIID, Ft. Detrick, Frederick, MD for medical research and development & radiation dosimetry.
(4)	To be used in AECL Gammacell 40 Irradiator located at USAMRIID, Ft. Detrick, Frederick, MD for medical research and development and radiation dosimetry.

9. STORAGE OF SEALED SOURCES

LINE NO.	CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED. A.	NAME OF MANUFACTURER B.	MODEL NUMBER C.
(1)	AECL Gammacell 220 Irradiator	Atomic Energy of Canada Limited	Gammacell 220
(2)	AECL Gammacell 40 Irradiator	Atomic Energy of Canada Limited	Gammacell 40
(3)	AECL Gammacell 220 Irradiator	Atomic Energy of Canada Limited	Gammacell 220
(4)	AECL Gammacell 40 Irradiator	Atomic Energy of Canada Limited	Gammacell 40

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	TYPE OF INSTRUMENT A	MANUFACTURER'S NAME B	MODEL NUMBER C	NUMBER AVAILABLE D	RADIATION DETECTED (alpha, beta, gamma, neutron) E	SENSITIVITY RANGE (milliroentgens/hour or counts/minute) F
(1)	REFERENCE:	Application for renewal of NRC Materials License - No. 08-01738-02, 18 July 1979, Tab 9				Medical,
(2)						
(3)						
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☒ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

REFERENCE: Application for renewal of NRC Material License - Medical, No. 08-01738-02, 18 July 1979, Tab 10.

☐ b. CALIBRATED BY APPLICANT

Attach a separate sheet describing method, frequency and standards used for calibrating instruments.

12. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate.) A	SUPPLIER (Service Company) B	EXCHANGE FREQUENCY C
☐ (1) FILM BADGE ☐ (2) THERMOLUMINESCENCE DOSIMETER (TLD) ☐ (3) OTHER (Specify): _____	REFERENCE: Application for renewal of NRC Materials License-Medical, No. 08-1738-02, 18 July 1979, page 3 of Form NRC-313M.	☐ MONTHLY ☐ QUARTERLY ☐ OTHER (Specify): _____

Info in a Act, FOIA

13. FACILITIES AND EQUIPMENT (Check were appropriate and attach annotated sketch(es) and description(s).

☐ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS (Include filtration, if any), ETC.

☒ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING (fixed and/or temporary), ETC.

☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.

☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

SEE SUPPLEMENT NO. 1.

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

Sealed sources specified in this application will be returned to the manufacturer for disposal.

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

15. RADIATION PROTECTION PROGRAM. Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures *(if needed)*, day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

16. FORMAL TRAINING IN RADIATION SAFETY. Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.

    a. Principles and practices of radiation protection.

    b. Radioactivity measurement standardization and monitoring techniques and instruments.

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

    d. Biological effects of radiation.

17. EXPERIENCE. Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

SEE SUPPLEMENT NO. 2

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, 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.

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.

a. LICENSE FEE REQUIRED *(See Section 170.31, 10 CFR 170)*	b. CERTIFYING OFFICIAL *(Signature)* [signature], LTC, MSC Adj Genrl c. NAME *(Type or print)* LEWIS A. MOLOGNE, MD
(1) LICENSE FEE CATEGORY:	d. TITLE Major General, MC Commanding
(2) LICENSE FEE ENCLOSED: $	e. DATE 17 MAY 1985

FORM NRC-313 I (1-79)

SUPPLEMENT NO. 1

Item 13, Form NRC-313(I), Facilities and Equipment Renewal Application for NRC NRC License 08-01738-03

1. Item 13a, Facilities:

a. AECL Gammacells listed on lines number 1 and 2, Item 8 of this application are located on the ground level of Building 40, Room B099, Walter Reed Army Institute of Research (WRAIR), Walter Reed Army Medical Center, Washington, DC. The Gammacell 220 is located in the northeast corner of Room B099. The Gammacell 40 is located in the irradiation suite of Room B099. Since the irradiation suite was designed for X-ray use, it is constructed with lead-lined walls, door, and a thick concrete ceiling. The only entrance to Room B099 is a door located in the southwest corner. A diagram of Room B099 is attached as Inclosure 1 to this supplement.

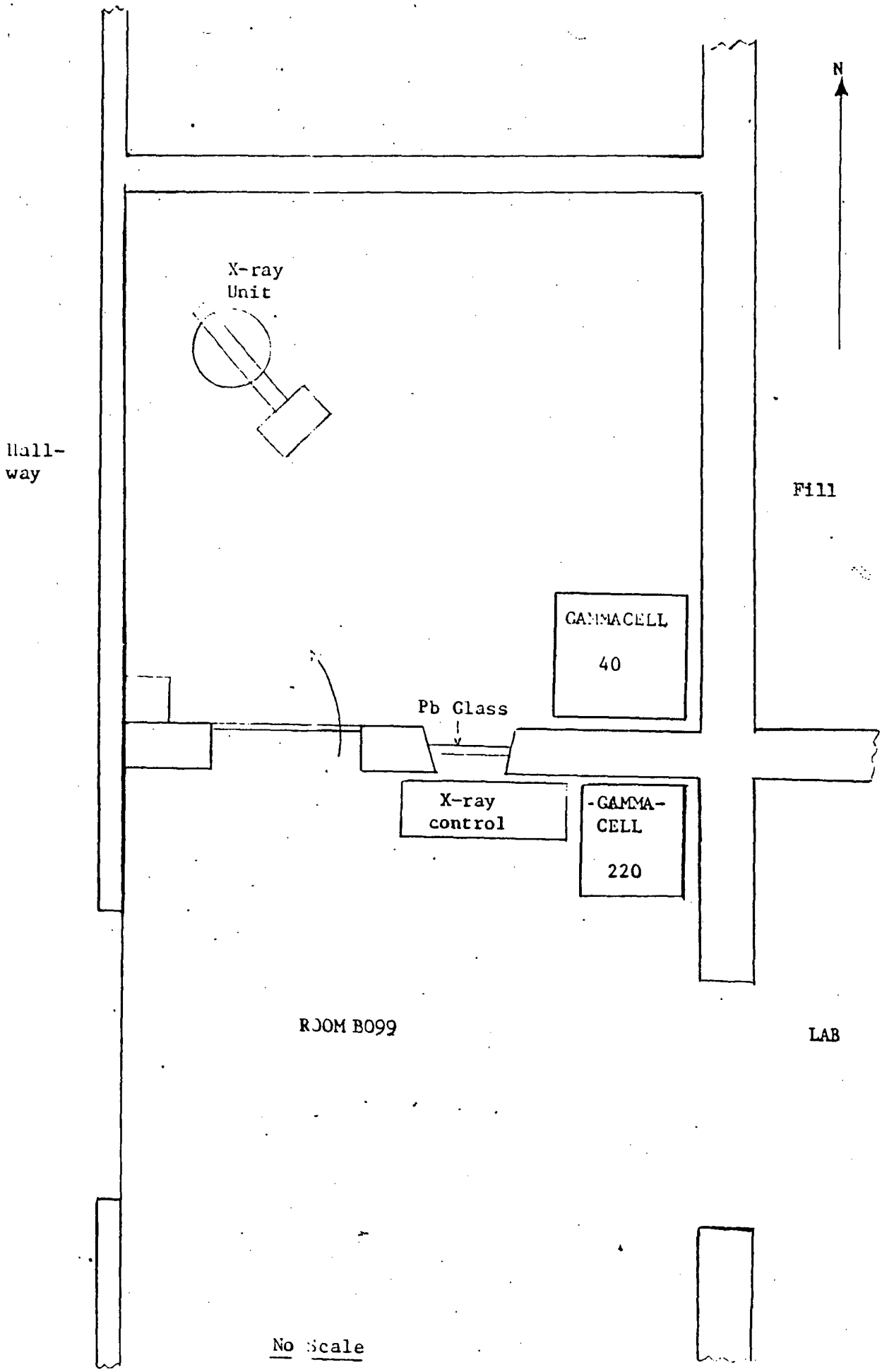
b. AECL Gammacells listed on lines number 3 and 4, Item 8 of this application are located on the ground level of Building 1425, Room AA413, USAMRIID, Fort Detrick, MD. Since Room AA413 was designed as an irradiation suite, the walls and ceiling are constructed of high density concrete of 12" and 16" thickness respectively. The room is bordered on two sides by biological hot suites and on two sides by infrequently used hallways. The overhead area is a pipe and ventilation crawl space which would be occupied only in case of repairs. A diagram of Room AA413 is attached as Inclosure 2 to this supplement.

2. Item 13b, Storage Facilities, Containers and Special Shielding:

AECL Gammacells listed in Item 8 of this application will be permanently used and stored in the locations specified above. Since the sealed sources will not be removed from their respective Gammacell units, no additional containment or shielding is required.

3. Item 13c and d, Remote Handling Tools and Respiratory Protective Equipment:

Since the sealed sources are an integral part of the Gammacell unit, no remote handling tools, equipment or respiratory protective equipment is required for operations involving use of the Gammacell units. Equipment that could be utilized to respond to an unforeseen emergency is specified in the application for renewal of NRC Material License - Medical, No. 08-01738-02, 18 July 1979, Tab 11.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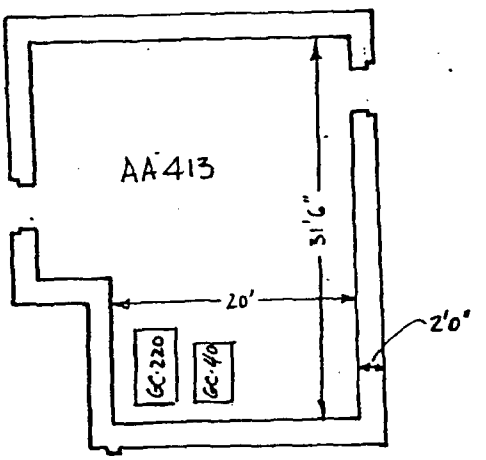
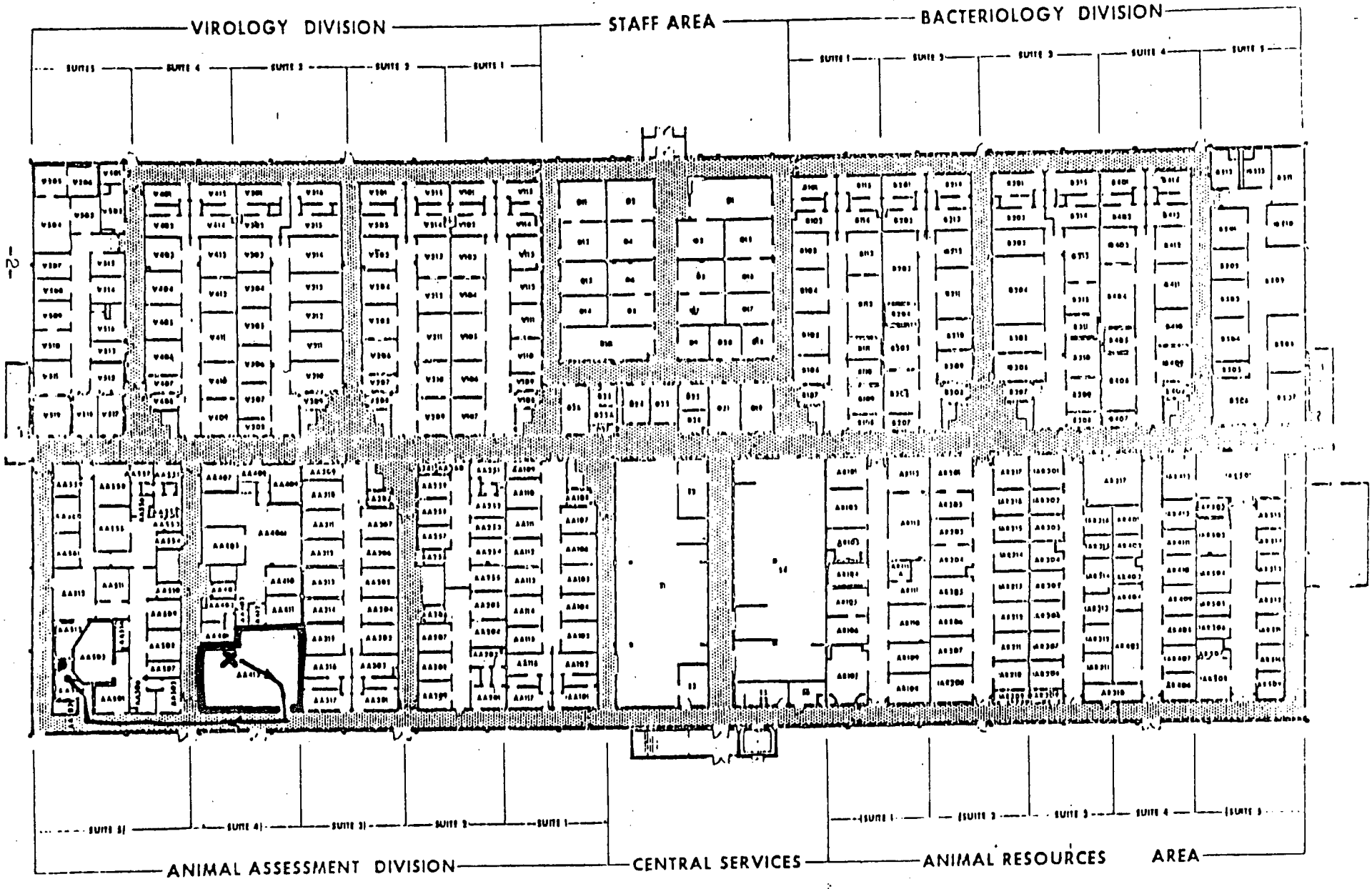


Incl 2 to Supl 1 of Item 13 Form NRC 313(I)


VIROLOGY DIVISION
STAFF AREA
BACTERIOLOGY DIVISION
SUITE 5
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SUITE 3
SUITE 4
SUITE 5
ANIMAL ASSESSMENT DIVISION
CENTRAL SERVICES
ANIMAL RESOURCES
AREA

FLOOR PLAN I

SUPPLEMENT NO. 2

Items 15, 16 and 17, Form NRC-313(I), Renewal Application for NRC License No. 08-01738-03

1. Item 15, Radiation Protection Program:

a. Radiation Protection Officer's duties and responsibilities are enumerated in AR 40-37, "Medical Services - Licensing and Control of Radioactive Materials for Medical Purposes," Appendix B, 7 January 1977. See Inclosure 1 to this supplement.

b. Radiation Control Committee's duties and responsibilities are enumerated in the application for renewal of NRC Materials License - Medical, No. 08-01738-02, 18 July 1979, Tab 7.

c. The procedure for obtaining authorization to use radioactive material under Walter Reed Army Medical Center's Nuclear Regulatory Commission Licenses is enumerated in the application for renewal of NRC Materials License - Medical, No. 08-01738-02, 18 July 1979, Tab 8.

d. Operating and safety procedures for AECL Gammacell 220 Irradiator and Gammacell 40 Irradiator are attached as Inclosures 2 and 3 respectively to this supplement.

(1) Any proposed modifications to a Gammacell unit, including all proposed deviations from established operational or administrative procedures shall be submitted to WRAMC Radiation Control Committee. This committee shall review such proposals and determine whether or not they are advantageous to the operation of a Gammacell unit. All proposals will be classified in one of the following categories.

(a) Major Safety Change: Any change which affects the degree of hazard associated with the operation of an AECL Gammacell unit.

(b) Minor Safety Change: Any change not classified as a major change which is directly associated with the safety of a Gammacell unit. Included in this category are changes in the principal administration and operational procedures, health physics procedures and mechanical or electrical system alterations to a Gammacell unit.

(c) Routine Change: Changes which have no bearing on the safety characteristics of a Gammacell unit.

(2) All major and minor safety changes require the approval of the WRAMC Radiation Control Committee prior to requesting approval of proposed changes, through appropriate channels, from the Nuclear Regulatory Commission.

SUPPLEMENT NO.2 (Continued)

e. Leak testing procedures shall be performed in accordance with the applicable sections of HSHL-HP Standard Operating Procedure Number 1-6, "Leak Testing and Inventory of Sealed Sources," 16 July 1980 (Inclosure 4).

2. Item 16, Formal Training in Radiation Safety; and Item 17, Experience:

a. Individuals who will use or directly supervise use of licensed material specified in this application must be approved by the WRAMC Radiation Control Committee in accordance with the procedures delineated in the application for renewal of NRC Material License - Medical, No. 08-01738-02, 18 July 1979, Tabs 7 and 8.

b. A resume of the training experience for LTC William E. Woodward, Health Physics Officer, WRAMC, is attached as Inclosure 5 to this supplement.

ARMY REGULATION
NO. 40-37

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, 7 *January 1977*

MEDICAL SERVICES

LICENSING AND CONTROL OF RADIOACTIVE MATERIALS FOR MEDICAL PURPOSES

Effective 1 February 1977

This is a complete revision of AR 40–37 and reflects the current requirements of the Nuclear Regulatory Commission as published in Title 10, Code of Federal Regulations, for the use and control of radioactive materials for medical purposes worldwide. Supplementation of this regulation is prohibited, except upon approval of The Surgeon General [HQDA (DASG-HCH) WASH DC 20310]. This regulation does not apply to the USAR and NBG.

1. Purpose. The purpose of this regulation is to—

a. Prescribe policies and procedures for the use and control of radioactive materials for medical purposes.

b. Prescribe procedures for obtaining Nuclear Regulatory Commission (NCR) licenses and amendments.

c. Prescribe procedures for obtaining Department of the Army (DA) radioactive material authorizations and amendments for radioactive materials not controlled or licensed by the NRC.

d. Establish procedures for the reporting of radioactive materials used in medical programs.

2. Scope. This regulation—

a. Applies to all Army medical facilities producing, procuring, storing, possessing, shipping, transferring, using, and disposing of radioactive materials for medical purposes worldwide.

b. Does not negate or supersede any NRC or Food and Drug Administration (FDA) requirements pertaining to the control, safeguard, and use of radioactive materials for medical purposes.

*This regulation supersedes AR 40–37, 12 August 1963.

Sep 29 '80

Incl 1 to Supl 2 to Item 15, Form NRC 313(I)

APPENDIX B
RADIATION PROTECTION OFFICER

B–1. The RPO is an individual designated by the commander to provide consultation and advice on the degree of hazards associated with radiation and the effectiveness of the measures to control these hazards. In addition, he will supervise the radiation protection program (AR 40-14).

B–2. Organizationally, the RPO will be in a position wherein he can effectively advise the commander and the radiation workers on all matters pertaining to radiation protection.

B–3. Responsibilities of the RPO will include, but not be limited to:

a. Providing the commander, Radioisotope/Radiation Control Committee and radiation workers with advice and assistance on all matters pertaining to radiation protection. This includes instructing and training of workers (users) and visitors in the safe use of protective equipment and radiation producing devices (AR 40-5 and AR 40-14).

b. Providing guidance on types of protective clothing and equipment required and its proper use (AR 40-5).

c. Reviewing radiological operations to determine compliance with regulations and approved procedures.

d. Reviewing or preparing SOP for operations involving sources of ionizing radiation prior to approval by the Radioisotope/Radiation Control Committee (AR 40-5).

e. Reviewing and approving the procurement of all radioactive material and radiation producing devices.

f. Insuring that proper personnel monitoring devices are used and that necessary bioassays are performed and required records are maintained of the results (AR 40-5 and AR 40-14).

g. Insuring that radiation survey/detection instruments used in radiation protection are properly calibrated and are available to radiation workers (AR 40-5 and TB 43-180).

h. Insuring that all radiation shields, containers and handling equipment are maintained in satisfactory condition (AR 40-5).

i. Insuring the proper posting of any radiation warning signs (AR 385-30).

j. Maintaining a current inventory of radioactive materials and a registry of radiation producing devices.

k. Maintaining the required radiation protection records (AR 340-18-6).

l. Conducting a physical inventory of radioactive materials at least once every 3 months.

m. Performing radiation surveys and leak tests or insuring that such surveys and leak tests are performed. The accuracy of tests and surveys, if performed by others, remains the responsibility of the RPO (AR 40-5).

n. Evaluating the hazard potential and adequacy of protective measures for existing and proposed operations (AR 40-5).

o. Monitoring incidents wherein unusual levels of radiation or radioactive contamination are suspected (AR 40-5).

p. Insuring that all radioactive materials are properly used, stored, handled, shipped and disposed of in accordance with applicable directives (AR 40-5).

q. Formulating and implementing the radiation protection program.

r. Investigating radiation accidents/incidents and overexposures to determine the cause and taking steps to prevent recurrence (AR 40-5 and AR 40-14).

s. Terminating a project or procedure involving the use of radioactive material or radiation producing device which is found to be a threat to health or property.

B–4. The RPO will act as executive agent for all NRC licenses and DA radioactive material authorizations for the possession, use and storage of radioactive material.

B–5. The RPO should be a member of the following installation/activity committees if such committees have been established (the name of the committees may vary):

a. The Radioisotope/Radiation Control Committee (AR 40-14).

b. The reactor Safeguards Committee (AR 385-80).

c. The Safety and Health Committee (AR 385-10).

d. The Accelerator Facility Safety Committee.

e. The Human Use Committee, if radioactive material is used (AR 40-38).

f. The Clinical Investigation Committee, if radioactive material is used (AR 40-38).

g. The Radioactive Drug Research Committee.

HEALTH PHYSICS
WALTER REED ARMY MEDICAL CENTER
Washington, D.C. 20012

SOP Number

OPERATING AND SAFETY PROCEDURES FOR AECL GAMMACELL 220 IRRADIATOR

1. GENERAL

a. The Gammacell 220 (GC-220) shall be used (operated) by, or under the direct supervision of individuals designated by the Walter Reed Army Medical Center (WRAMC) Radiation Control Committee, Deputy Commander, WRAMC, Chairman.

b. The authorized Principal User is directly responsible for the control and safe use of this irradiator and will designate individuals to operate the GC-220 as approved by the WRAMC Radiation Control Committee.

c. The GC-220 shall be used for medical research and development in radiation biology and radiation dosimetry.

2. DEFINITIONS

Because the precise meaning given to one or more critical terms frequently determines the interpretation of a statement, the following definitions are given for certain words and phrases as they are used in this document:

a. "Shall" - denotes that the ensuing recommendation is necessary or essential to meet the currently accepted standards of radiation protection.

b. "Should" (is recommended) - indicates advisory recommendations that are to be applied when practicable.

c. "Explosive" - explosives are either solid or liquid, either mixtures or single compounds, and act by explosive chemical reaction, liberating at high speed heat and gas, which causes tremendous pressure.

d. "Flammable" - materials capable of being easily ignited; preferred to "inflammable" because of possible ambiguity of the in prefix.

e. "Individual" and/or "Operator" - a person designated by the authorized Principal User as approved by the WRAMC Radiation Control Committee, to operate the AECL Gammacell 220 Irradiator.

f. "Emergency" - an unforeseen combination of circumstances (e.g., failure of an interlock or safety device, fire, ruptured or leaking source, etc.) that poses a threat to personnel or property by ionizing radiation.

3. RESPONSIBILITIES

a. The authorized Principal User:

(1) Ensuring that the GC-220 is operated only by individuals authorized to do so by the WRAMC Radiation Control Committee and in accordance with the conditions of WRAMC Radioactive Material Authorization.

(2) Instruction of individuals in safe operating procedures in accordance with instructions outlined herein. He shall promulgate rules for working safety, including any restrictions of the operating technique known to be necessary.

(3) Ensuring that these instructions and references contained in para 7 are available at the GC-220 unit at all times.

(4) Promptly reporting any source malfunction, accident, or other unplanned occurrence that could result in an unsafe condition or exposure to personnel to the WRAMC Health Physics Officer (301-427-5107).

(5) Assure that all personnel operating the unit are monitored by appropriate personnel monitoring devices.

(6) Assure that personnel operating the unit have been instructed in the hazards and nature of injuries resulting from overexposure to ionizing radiation [e.g., attendance at appropriate WRAMC personnel training programs (HSWP-QHP Memo #2)].

b. WRAMC Health Physics:

(1) Conducting routine radiation protection surveys and inspections.

(2) Providing technical assistance as required.

(3) Providing calibration and routine maintenance services for radiation detection and measuring instruments required in WRAMC Radioactive Material Authorization.

c. Individual Operators:

(1) Operating the unit in accordance with the operation and safety procedures delineated in this SOP.

(2) Recording all pertinent information in the operating log maintained by the authorized Principal User.

(3) Being familiar with the content of these instructions, requirements of the WRAMC authorization, and other regulations as may be prescribed by the authorized Principal User.

(4) Locking the GC-220 unit and the room upon completion of use.

(5) Ensuring that the keys to the unit and the room door are properly secured to prevent unauthorized use.

(6) Reporting all malfunctions, accidents, and any other unplanned occurrence that could result in an unsafe condition or exposure of personnel promptly to the authorized Principal User.

4. OPERATING PROCEDURES.

a. Insert key in keyswitch and turn clockwise 90°.

b. Raise the drawer by pressing the UP rocker switch.

c. To opern the collar doors, press and hold in the button on the top of the door interlock, grasp the right hand door handle, pull back the latch lever, release the button and pull the doors open.

d. Slide the sample chamber locking ring to the right, remove the door by lifting it up and outwards.

e. Place the sample in the chamber. The access tube in the drawer top accommodates accessory tubes and electrical leads, which should be fitted in accordance with the instructions provided in the Gammacell 220 Accessories Manual.

f. Replace the sample chamber door with a forward and downward motion. Move the locking ring to the left until it snaps into position. If difficulties are experienced, check that the door is correctly positioned in the port.

g. To close the collar doors, press and hold in the button on the top of the door interlock. Grasp the right hand door handle, pull back the latch lever, release the button and push the doors closed.

h. If automatic operation is desired set the irradiation time in the following manner:

(1) Push the timer reset knob, turn it clockwise 90°, and release; the white line on the knob should be horizontal.

(2) Open the hinged cover which protects the predetermining drums; turn the knurled wheels either direction until the desired number sequence appears in the windows.

(3) Rotate the selector switch to hours, minutes or seconds. Close the hinged cover and turn the timer reset knob counterclockwise; the white line on the knob should be vertical, press the reset knob to set the timer.

(4) Push the DOWN switch. The drawer will lower to the irradiating position, activate the timer, and remain there until the preset time interval has elapsed, when it will automatically raise.

i. If manual operation is desired rotate the selector switch to MANUAL and press the DOWN switch. The drawer will lower and remain there indefinitely until the UP switch is operated.

j. To remove the sample repeat steps b - d.

5. SAFETY FEATURES

There are a variety of safety features incorporated into the unit for the protection of the operator.

a. Three microswitches are mounted on the collar door to ensure that:

(1) The sample chamber door is properly located.

(2) The locking ring is in position.

(3) Both collar doors are closed.

b. A fourth microswitch is located on the top shilding plug to ensure that the plug is closed.

c. Unless all four microswitches are actuated the drive motor will not start.

d. The self-locking feature of the worm gear reducer acts as a brake to prevent the drawer moving down under its own weight.

e. A solenoid-operated ram prevents the sample drawer from moving down in the event of a drive system mechanical failure.

f. Drawer movement can be arrested by switching off the electrical supply key switch.

g. A solenoid-operated door interlock ensures the collar doors can only be opened with the drawer in the safe position.

h. Top plug rest and safety column ensure the top plug can only be opened with the drawer in the full up position.

6. SAFETY/EMERGENCY PROCEDURES

a. The GC-220 shall be operated as described in the Atomic Energy of Canada Limited "Operator's Manual for the Gammacell 220 Cobalt 60 Irradiation Unit," edition 7, February 1978, and in accordance with this Standard Operating Procedure.

b. Emergency Procedures: See Annex A of this Standing Operating Procedure.

c. No individual shall undertake repair, perform any maintenance, remove any interlock and/or safety device, or make any changes in and/or on the GC-220 without prior approval of the authorized Principal User and the Health Physics Officer, WRAMC.

d. Under NO circumstances shall explosive material be irradiated in the GC-220.

e. All operators and/or assistants shall wear personnel monitoring devices while working around and/or operating the GC-220 Irradiator.

f. Health Physics, WRAMC, will perform leak tests, periodic inspections and radiation protection surveys.

g. An operating log shall be maintained by the authorized Principal User.

h. Key Control:

(1) Operating keys will be held under direct supervision of the authorized Principal User approved by the WRAMC Radiation Control Committee. The Principal User is responsible for assuring proper key control and key security.

(2) Duplicate keys for the GC-220 and GC-40 will be secured by the authorized Principal User.

7. REFERENCES

a. Atomic Energy of Canada Limited "Operator's Manual for the Gammacell 220 Cobalt 60 Irradiation Unit," edition 7, February 1978.

b. Nuclear Regulatory Commission By-Product Material License No. 08-01738-03.

1 Incl
ANNEX A - Emergency Procedures
for AECL Gammacell
220 Irradiator

ANNEX A to Health Physics SOP Number

EMERGENCY PROCEDURES
FOR
AECL GAMMACELL 220 IRRADIATOR

1. In the event of an emergency, malfunction, or other unusual occurrence, the following individuals shall be notified after turning the console to the OFF position:

a. Authorized Principal User, WRAIR, Extension 576-3428.

b. Radiation Protection Officer, WRAIR, Extension 576-3428.

c. Health Physics Officer, WRAMC, Extension 301-427-5107.

d. Staff Duty Officer, WRAMC (after duty hours), Extension 576-3501/2309.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority.

2. In the event of a fire, the following individuals shall be notified:

a. Fire Department, WRAMC, Extension 576-3317.

b. Authorized Principal User, WRAIR, Extension 576-3428.

c. Radiation Protection Officer, WRAIR, Extension 576-3428.

d. Health Physics Officer, WRAMC, Extension 301-427-5107.

e. Staff Duty Officer, WRAMC (after duty hours), Extension 576-3501/2309.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority. Fire fighters may enter the area after the radiation hazard has been determined. There is little likelihood of radiation hazard unless the temperature of the source shield reaches the melting point of lead (621°F). Water should be sprayed on the source shield if there is any possibility of the temperature approaching this value.

3. Following an emergency the GC-220 shall not be operated until an inspection and a radiation protection survey have been conducted by WRAMC Health Physics.

OPERATOR'S MANUAL
for the
GAMMACELL 220
cobalt 60 irradiation unit

serial numbers 160 and subsequent

EDITION 7
FEBRUARY 1978
2M002053

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
P.O. Box 6300, Station J, Ottawa, Canada, K2A-3W3

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LIST OF ILLUSTRATIONS

PART 1
DESCRIPTION

GENERAL

The Gammacell 220 is a Cobalt 60 irradiation facility manufactured by Atomic Energy of Canada Limited for use in an unshielded room. Figure 1 illustrates the external features and Figure 2 the general dimensions of the unit.

The unit basically consists of an annular source (see Figure 3) permanently enclosed within a lead shield, a cylindrical drawer, and a drive mechanism to move the drawer up or down along the source centre-line. The drawer has a chamber to carry samples to be irradiated from outside the shield to the source.

Samples up to approximately six inches in diameter and eight inches in height can be accommodated in the chamber. Liquid, gaseous, electrical or mechanical connections can be introduced into the sample chamber through an access tube in the upper portion of the drawer. An electrically powered digital timer automatically raises the drawer at the termination of a sample irradiation. Times may be preset to a maximum of 999.9 hours.

ELECTRICAL

The Gammacell 220 operates on a 220 volt, 3 phase, 50/60 Hertz, 15 ampere supply. The supply is connected through a starter to a ½ hp drive motor. A step-down transformer connected across one phase of the supply provides the 115 volt, 1 ampere control circuit requirement.

WEIGHT

Crated	8,500 lb (3856 kg)
Uncrated	8,300 lb (3765 kg)

HEAD

The head (see Figure 1) serves as a cylindrical shield for the source and as a guide for the moving drawer. It consists of a leak-proof shaped cylinder which contains approximately six thousand pounds of lead to provide ten inch thick shielding.

A stepped, circular hole running vertically through the centre of the head locates the inner head plug, the source cage assembly and the moving drawer.

COLLAR

Mounted on top of the head is a 6½ inch (16.51 cm) deep lead filled annular steel collar. The collar provides shielding for the transient beam occurring when the relatively unshielded volume of the sample chamber moves through the inner plug. The rear, semi-circular portion of the collar is attached to the head. The front portion opens as two doors, each hinged to the rear portion of collar. Pressure on a lever behind the handle on the right door raises a latch and permits the overlapping doors to be opened. The doors can be opened only when the drawer is raised, when access is required to the sample chamber.

INNER HEAD PLUG

The inner head plug is a lead filled steel cylinder which fits into the head above the source cage. It forms part of the shielding and also houses the upper drawer guides. The plug must not be removed except for source changing procedures supervised by A.E.C.L. staff.

SOURCE CAGE ASSEMBLY

The source cage is located in the centre of the head directly beneath the inner head plug. The stainless steel cage contains forty-eight double-sealed source pencils, each 8.31 inches (21.11 cm) long, set in an annular formation on an 8.32 inch (20.91 cm) pitch circle diameter (see Figure 3). Each tubular pencil contains seven Cobalt 60 slugs completely sealed in by welded end caps.

The inside diameter of the cage is sufficiently greater than the diameter of the drawer to prevent excess radiation leakage through the clearance between the drawer and head.

DRAWER

The drawer moves vertically through the centre of the head, inner plug and source cage assembly. It is 59.0 inches (149.86 cm) long and 6½ inches (16.51 cm) in diameter, and is constructed from four distinct components; the top shielding plug, the drawer top, the sample chamber and the drawer bottom. The top shielding plug is hinged to the drawer top. The other three components are keyed together to ensure mechanical alignment and secured with screws. The drawer is guided in the head and inner head plug by four bronze bearings.

TOP SHIELDING PLUG

The lead filled closed steel cylindrical plug is 4 inches (10.16 cm) in diameter and 5¼ inches (13.34 cm) long. It is hinged to a steel casting on the drawer top and provides a radiation shield over the drawer top access tube. When the drawer is raised the top plug may be tilted back to permit the introduction of accessories into the sample chamber, see Figure 5. Electrical interlocks prevent the drawer being lowered with the plug in the open position. During a sample irradiation procedure the plug cannot be opened.

DRAWER TOP

The 6½ inch (16.51 cm) diameter, 14-3/8 inch (36.51 cm) long closed stainles steel cylinder has a 1¾ inch (3.17 cm) inside diameter access tube through its centre. The space between the stainless steel outer casing and the stainless steel access tube is filled with lead. Welded to the drawer top is a steel casting onto which the top shielding plug is hinged. The casting is shaped to provide indirect entry to the access tube; it also provides two sockets tapped ½ - 20 UNF - 2B, 3/4 inch (1.91 cm) deep to accommodate accessory mounting posts. The access tube has a one inch (2.54 cm) deep, 1-3/8 -12-2B female thread to accept the tube insert accessory assembly.

SAMPLE CHAMBER

The chamber is a thin wall closed, non-corrosive metal cylinder with a lift out full width door. The inside dimensions of the chamber are 6.10 inches (15.49 cm) diameter and 8.06 inches (20.47 cm) high. The access port is 7.91 inches (20.07 cm) high and 6.00 inches (15.24 cm) wide. A step on the bottom of the door and a locking ring at the top of the chamber retain the door in place, see Figure 4. An opening is provided in the top and bottom of the chamber for the access and drain tubes. Electrical interlocks prevent drawer movement when the door or door latch is improperly closed.

DRAWER BOTTOM

The drawer bottom is formed from a 6.5 inch (16.51 cm) diameter, 30.5 inch (77.47 cm) long stainless steel tube, lead filled, and closed at both ends. A spiral stainless steel drain tube, 7/16 inch (1.11 cm) internal diameter, runs the length of the drawer bottom to facilitate drainage of liquid spills in the sample chamber. The drawer bottom is sufficiently long enough to provide irradiation shielding beneath the source chamber when the drawer is up or down.

A rectangular bracket on the base of the drawer provides a pin joint connection to the drive mechanism.

DRIVE MECHANISM

The drawer assembly is raised or lowered by a chain and sprocket system (see Figure 6). The system motive power is provided by a ½ hp, 220 volt, 3 phase motor; the output speed of which is reduced initially through a V-belt and pulley connection to a worm and gear reducer. Further speed reduction is obtained through a chain and sprocket drive to a shaft. A sprocket at each end of the shaft transmits the shaft rotation to the smaller of double head sprockets mounted each side of the head base. The head sprockets rotate less than one revolution each complete up or down movement of the drawer. Two roller chains are pinned at one end to each of the larger of the double head sprockets and at the other end to each end of a full width T-bar.

The T-bar is pin jointed to a bracket on the bottom of the drawer. With the partial rotation of the head sprockets on upward drawer movement the lift chains wrap around the sprockets and raise the T-bar.

DRAWER MOVEMENT

Drawer movement is electrically governed by the control panel. Microswitches mounted on the head sprockets are cam actuated, Figure 7, before the end of drawer travel and disconnect the electrical supply to the motor. The momentum of the drawer carries it the remaining distance to the mechanical stops. The drawer travels 19.72 inches (50.02 cm) in approximately seven seconds. Microswitches S10 and S15 provide a back up to these cam operated microswitches.

Mechanical stops are provided at the limits of the drawer movement. The upper stop is formed from an adjustable bolt, mounted on the underside of the shield head, which stops against a nylon pad inserted in the top side of the T-bar. The lower stop is formed from a nylon tipped adjustable bolt, mounted on a fixed bracket (see Figure 7), which stops against the underside of the drawer when it reaches the lowest point of its movement.

A hand crank is provided to enable the drawer to be operated manually in the event of a power supply failure.

CONTROL PANEL

The unit controls are grouped on one panel situated at the top right of the head, as illustrated in Figure 8. From the top of the panel the controls are:

1. Digital timer - to provide irradiation time settings to a maximum of 999.9 hours. A reset button returns the timer to its original setting. The timer commences operation when the drawer reaches the irradiation position.
2. Selector switch - to provide for manual operation or selection of time settings in seconds, minutes or hours.

3. Movement switch - to select up or down drawer movement.
4. Key switch - to control the electrical supply to the unit control circuit.

SAFETY FEATURES

For the protection of the operator several safety features have been incorporated in the unit.

Three microswitches are mounted on the collar door (Figure 9) to ensure that:

a) the sample chamber door is properly located.

b) the locking ring is in position.

c) both collar doors are closed.

A fourth microswitch is located on the top shielding plug to ensure that the plug is closed. Unless all four microswitches are actuated the drive motor will not start.

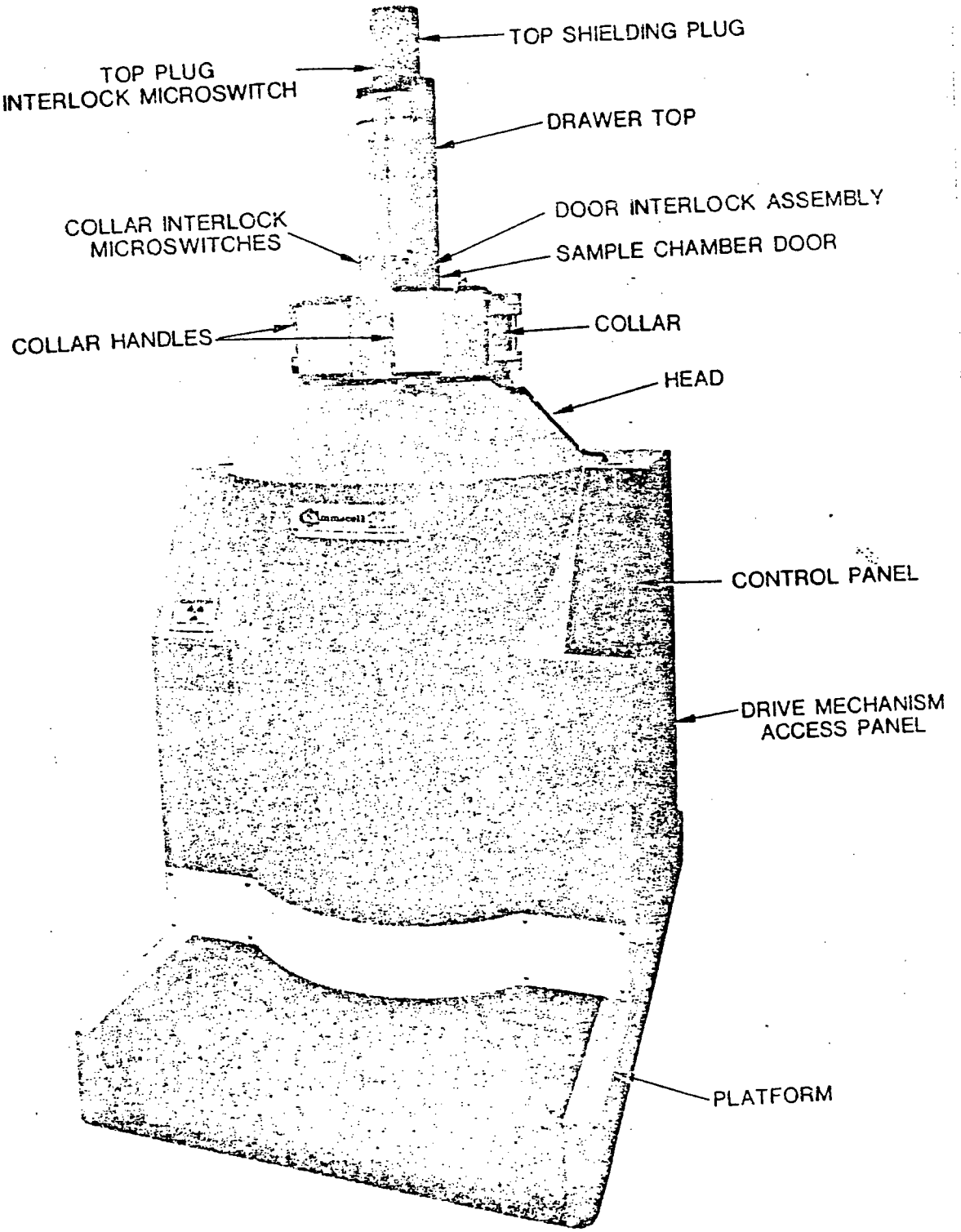
The self-locking feature of the worm gear reducer acts as a brake to prevent the drawer moving down under its own weight.

A solenoid operated ram, mounted on the underside of the head, actuates when the drawer stops in the raised position. The ram locates against a rectangular bracket on the drawer bottom and prevents the drawer moving down in the event of a drive system mechanical failure.

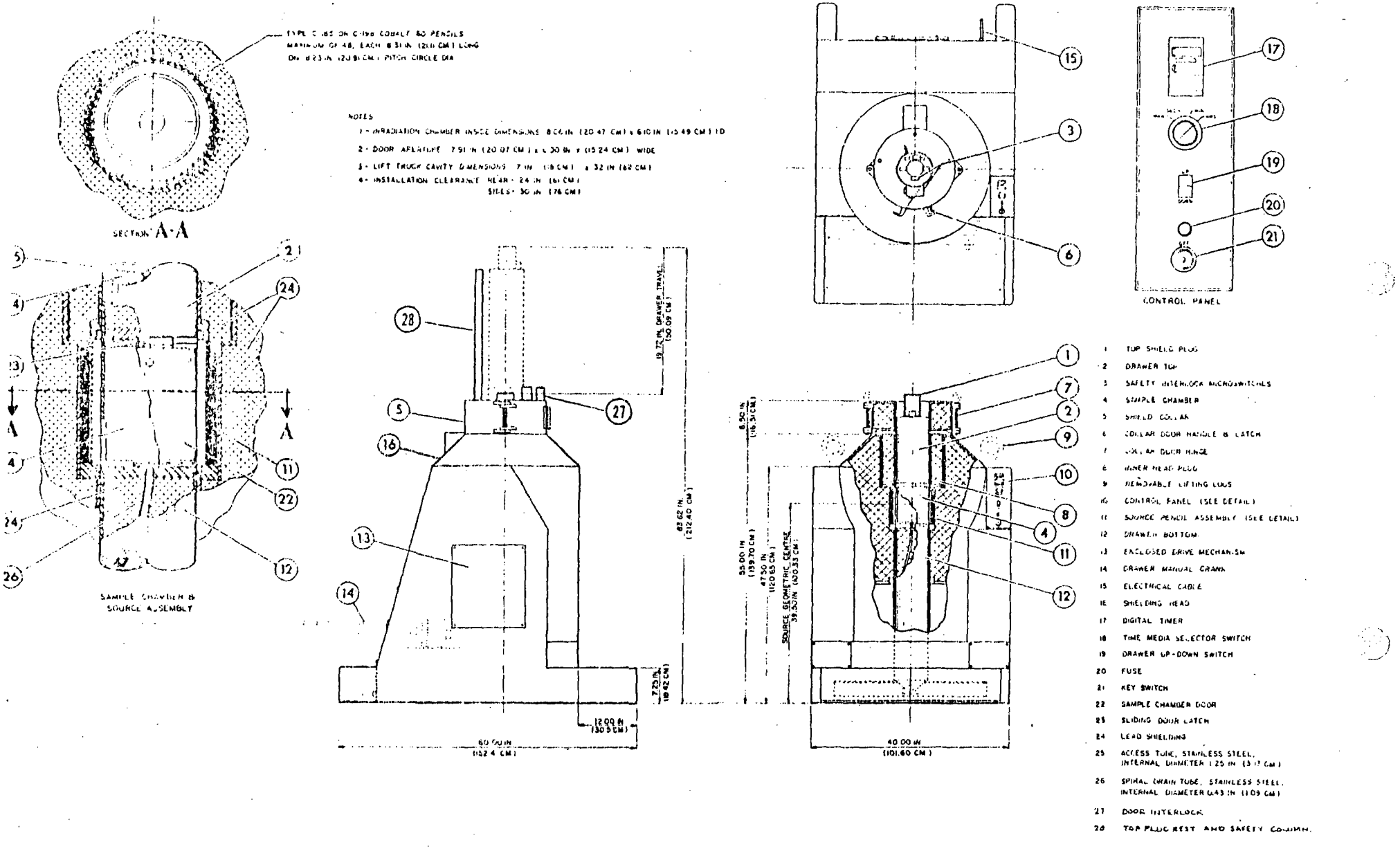
Drawer movement can be arrested by switching off the electrical supply key switch.

A solenoid operated door interlock ensures the collar doors can only be opened with the drawer in the safe position.

Top plug rest and safety column ensure the top plug can only be opened with the drawer in the full up position.

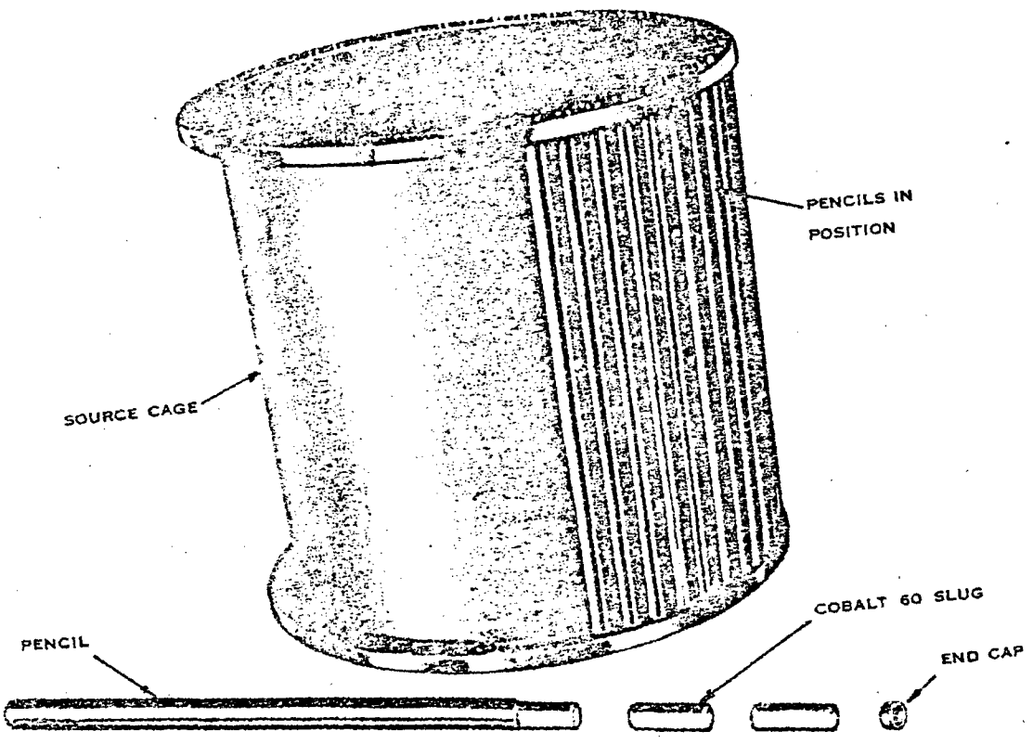


OVERALL VIEW OF GAMMACELL 220

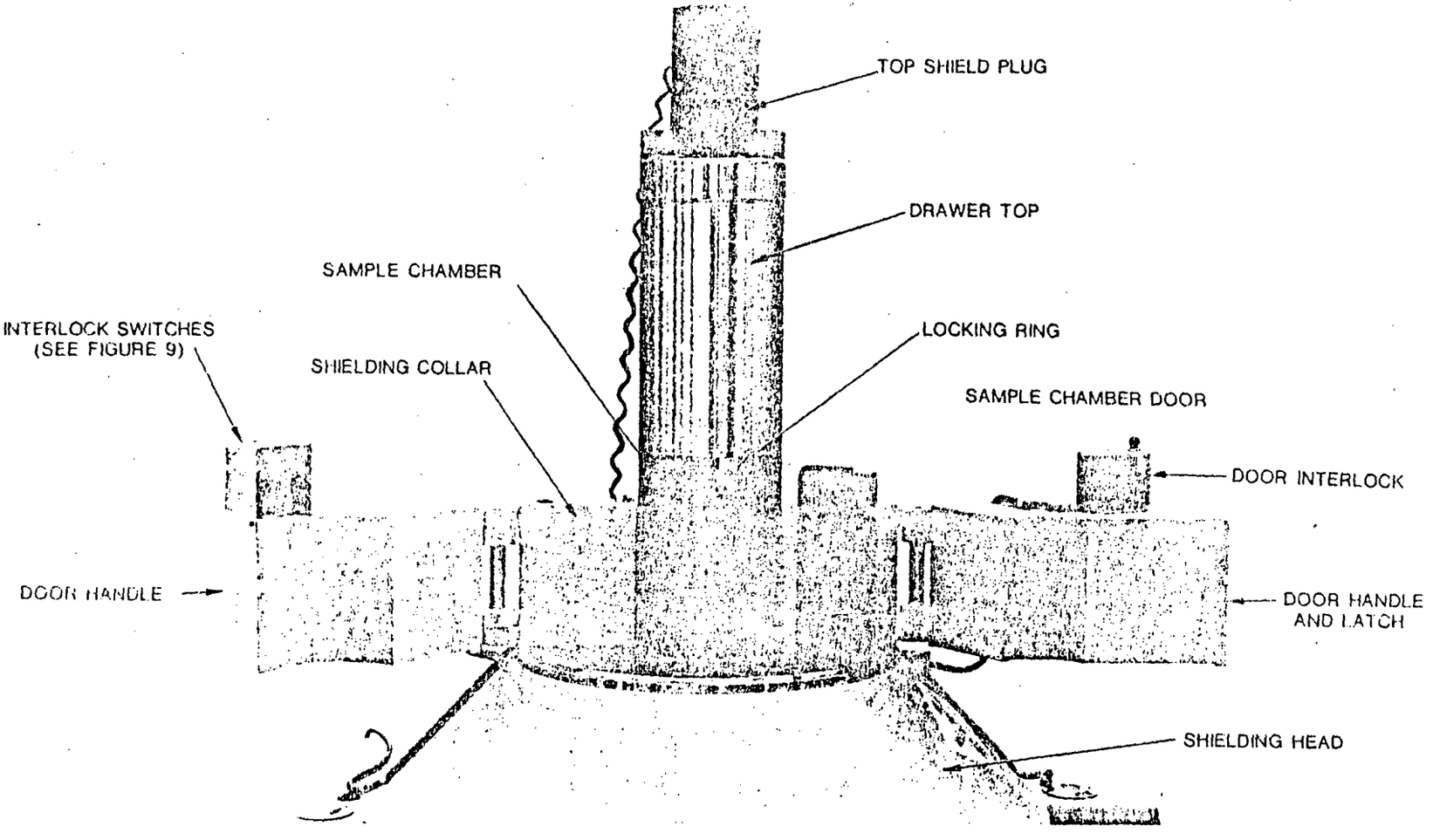


GAMMACELL-220 - GENERAL DIMENSIONS

FIGURE 2

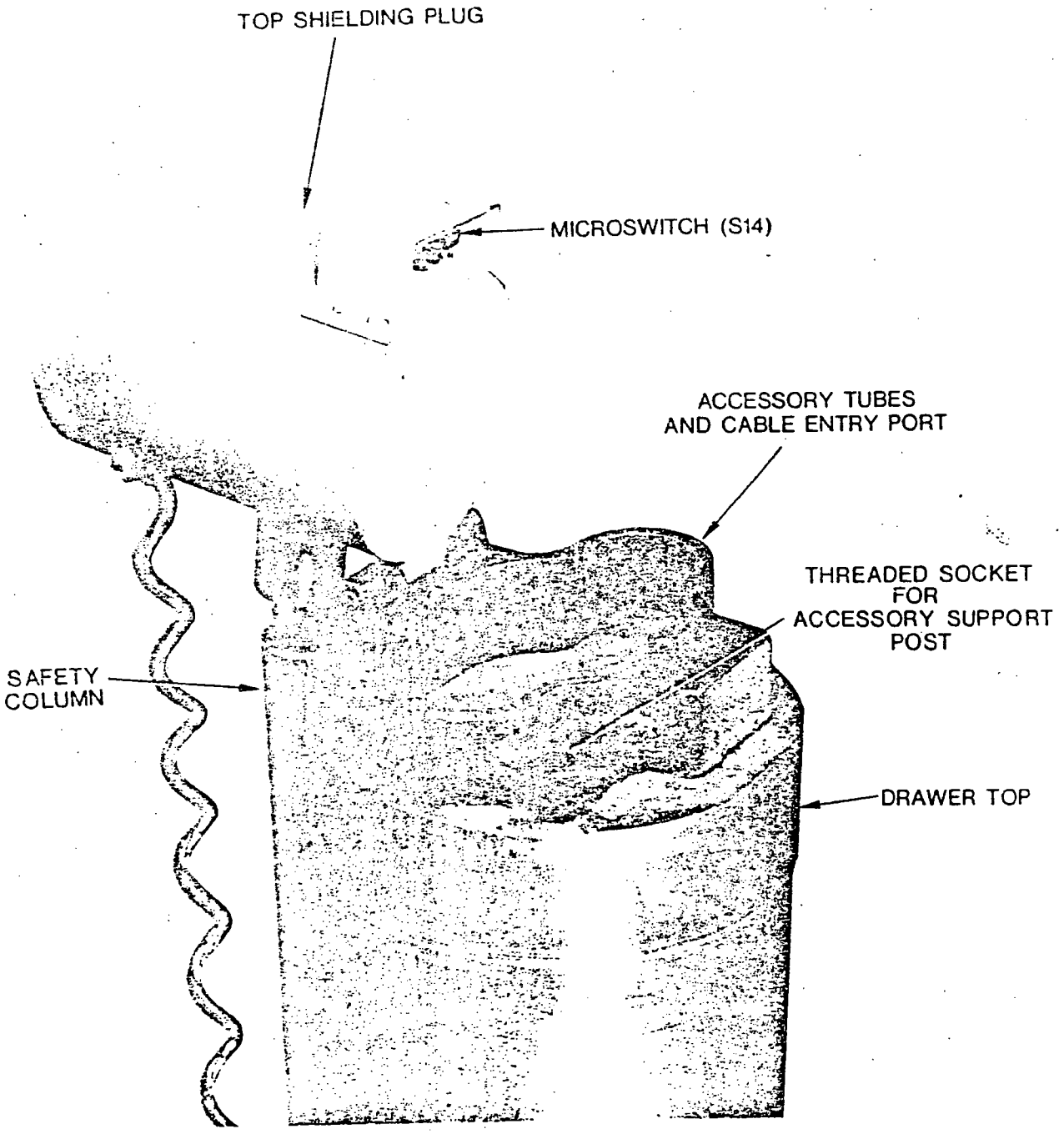


SOURCE PENCILS AND CAGE



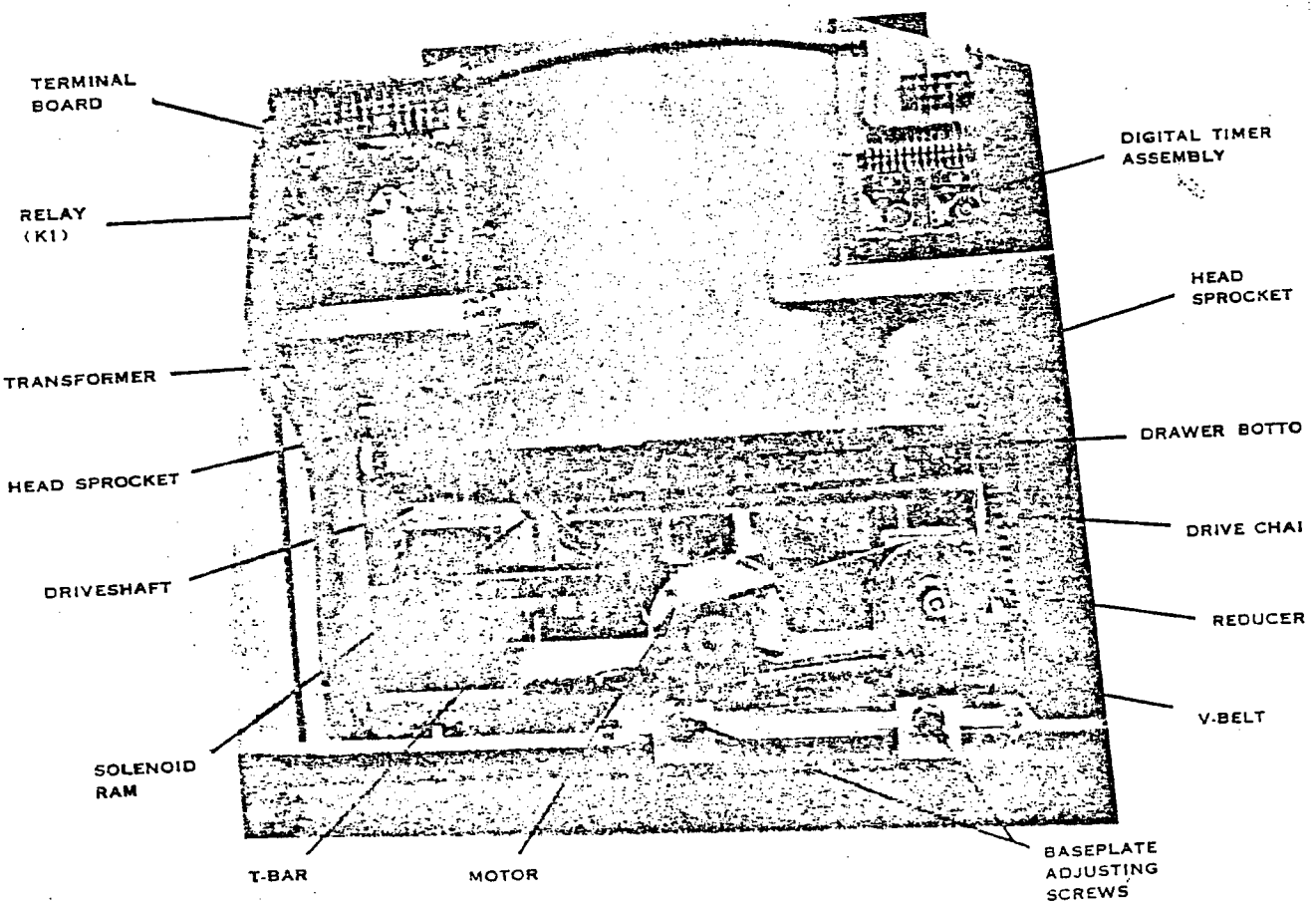
COLLAR AND SAMPLE CHAMBER

FIGURE 4



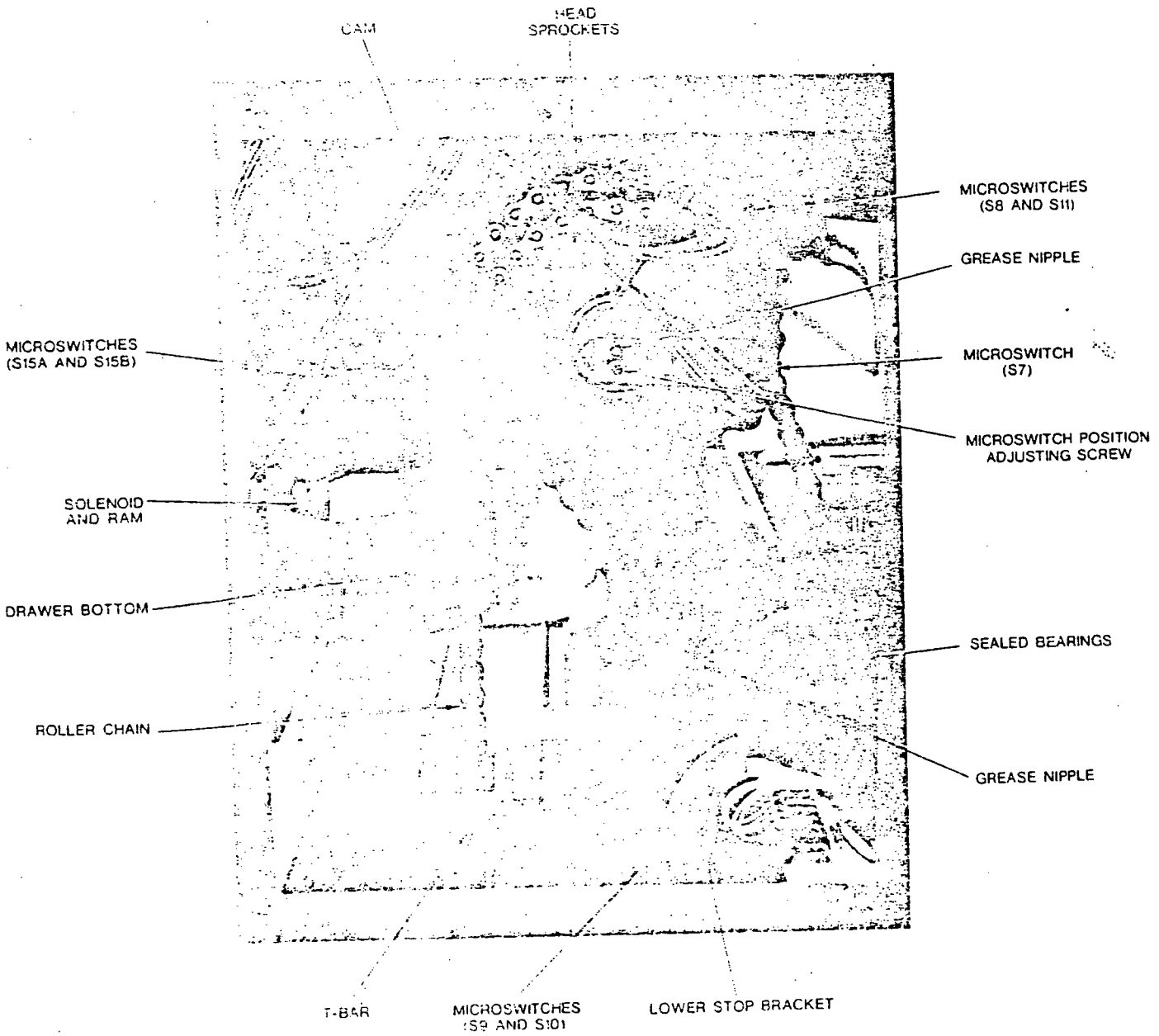
TOP SHIELDING PLUG

FIGURE 5



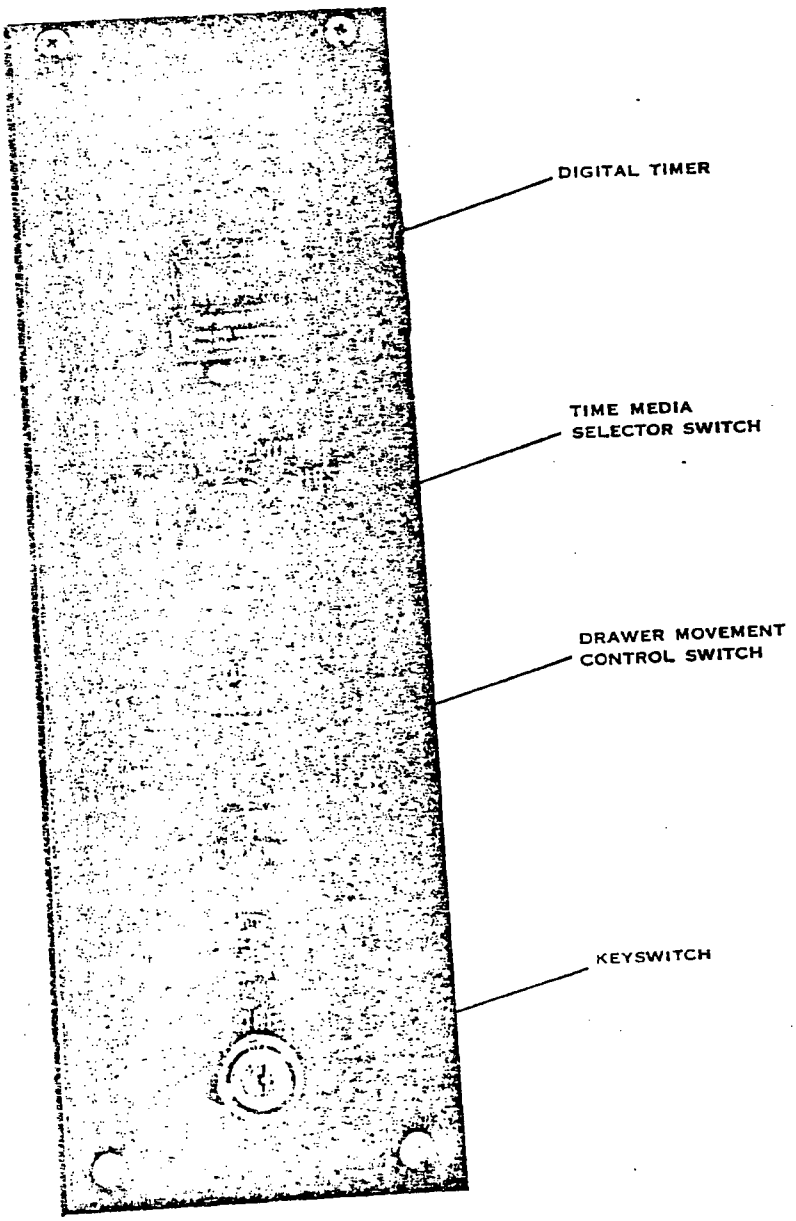
REAR OF UNIT

FIGURE 6



DRIVE MECHANISM

FIGURE 7



CONTROL PANEL

FIGURE 8

PART 2

OPERATION

The Gammacell 220 has been designed to enable operation with minimum exposure to radiation. To ensure protection, operators should adhere to the following procedures.

AUTOMATIC OPERATION

1. Raise the drawer by first inserting the key in the key switch and turning it 90° clockwise, then press the UP rocker switch. Press and hold the button on top of the door interlock.
2. To open the collar doors, press and hold in the button on the top of the door interlock, grasp the right hand door handle, pull back the latch lever, release the button and pull the doors open.
3. Slide the sample chamber locking ring to the right, remove the door by lifting it up and outwards.
4. Place the sample in the chamber. The access tube in the drawer top accommodates accessory tubes and electrical leads, which should be fitted in accordance with the instructions provided in the Gammacell 220 Accessories Manual.

   NOTE: Materials expected to change state during irradiation should be placed in suitable containers.

   Liquids expected to expand or boil should be provided with secondary containers for overflow, or vented to one of the access tubes.

   The sample chamber and source cage will not withstand repeated spills or corrosive materials.
5. Replace the sample chamber door with a forward and downward motion. Move the locking ring to the left until it snaps into position. If difficulties are experienced, check that the door is correctly positioned in the port.
6. To close the collar doors, press and hold in the button on the top of the door interlock. Grasp the right hand door handle, pull back the latch lever, release the button and push the doors closed.
7. Set the required irradiation time on the digital timer in the following manner. (Refer to Figure 8).

a) Push the timer reset knob, turn it clockwise 90°, and release; the white line on the knob should be horizontal.

b) Open the hinged cover which protects the predetermining drums; turn the knurled wheels either direction until the desired number sequence appears in the windows.

c) Rotate the selector switch to hours, minutes or seconds. Close the hinged cover and turn the timer reset knob counterclockwise; the white line on the knob should be vertical, press the reset knob to set the timer.

8. Push the DOWN switch. The drawer will lower to the irradiating position, activate the timer, and remain there until the preset time interval has elapsed, when it will automatically raise.

9. To remove the sample repeat steps 2 and 3.

MANUAL OPERATION

1. For initial set-up read the preceding steps 2 to 6.

2. Rotate the selector switch to MANUAL.

3. Press the DOWN switch. The drawer will lower and remain there indefinitely until the UP switch is operated.

POWER FAILURE

In the event of a power failure the timer will stop and it will be necessary to raise the drawer manually.

1. Turn the key switch to the OFF position.

2. Spring out the large round button near the lower right corner of the back cover.

3. Push the crank (Figure 2, item 14) through the hole until it snaps into the extension on the input shaft of the reducer.

4. Crank in a clockwise direction to raise the drawer.

NOTE:

1. If it is necessary to change an operation time do not alter the digit settings while the drawer is down and the timer is operating. Raise the drawer and set the timer as described in AUTOMATIC OPERATION, step 7.
2. On completion of a timed operation the timer can be reset to the same operation time by depressing the reset knob.
3. If it is required that the drawer be raised during an operation the timer will store the remaining portion of the preset time until the operation is resumed.

PART 3

MAINTENANCE

The back and both side panels are removable, and provide access to the drive mechanism.

PREVENTIVE

Every six months. (Refer to Figures 6 and 7).

1. Motor - the motor is sealed and lubricated for life.
2. Worm Gear Reducer - the reducer is sealed and lubricated for life.
3. Shaft Bearings - apply a good quality bearing grease to the grease nipples on both sealed bearings and both sets of head sprockets. Do not use oil.
4. Chains - wipe with an oil-soaked cloth.

GENERAL

Mechanical - Collar Doors

The collar doors are adjusted to be as close as possible to the top surface of the inner head plug. If they become difficult to open (appear to drag), turn the adjusting screw on the underside of the hinges inward until the doors will move freely.

V-Belt

Check the V-belt periodically for signs of wear. Belt tension should be such that the total vertical belt deflection midway between the motor and the reducer is approximately one-half inch (1.27 cm). If adjustment is required, loosen the four motor mounting screws and move the motor to suit. If the belt is too loose the motor drive sprocket will slip and not transmit movement to the drawer.

Chains

Prior to adjusting the roller chain, raise the drawer, switch off the electrical supply and crank the drawer down until it rests on the bottom stop. After adjustments are made and all bolts are tightened, crank the drawer back to the raised position.

The reducer output chain may become slack due to initial stretching under load. Depending on the position of the drawer one side of the chain will always be taut, but the other side may be slack. If the total movement play on the slack side is more than ½ inch (1.27 cm), loosen the four baseplate mounting bolts, tighten the two baseplate adjusting screws and then the mounting bolts.

When necessary, adjust the sealed bearing brackets to tighten the chains between the shaft and head sprockets. This operation will slacken the reducer output chain which will then require re-adjustment of the baseplate.

MECHANICAL STOPS

The lower stop (Figure 7) is adjusted so that the geometric centre of the sample chamber corresponds with that of the source assembly when the drawer is lowered to the irradiating position. Because of the wear on chains and the stop this position should be checked once a year. When the drawer is in the irradiating position the V-groove near the top of the drawer top should line up with the top surface of the inner head plug. The manual crank should be used to position the drawer, then the threaded stop adjusted to suit.

The upper stop should be adjusted so that the sample chamber door is easily removed. It is initially adjusted to position the chamber door sill approximately ¼ inch (0.64 cm) above the inner plug top surface.

CHAMBER DOOR

If the locking ring is difficult to move, the plunger may be adjusted by turning it inward.

ELECTRICAL -

Microswitches

There are ten microswitches on the unit:

S4 - bracket mounted on the left collar door (see Figure 9), the switch is actuated by the right door when the collar doors are closed.

S5 - mounted adjacent to S4, the switch lever drops into a slot in the locking ring when the ring is properly closed.

S6 - mounted adjacent to S4 and S5, the switch is actuated by the sample chamber door.

S7 - mounted on an adjustable bracket on the right side head sprocket, the switch is cam operated to remove the supply to the motor before the end of drawer downward movement. If the drawer fails to reach the irradiating position the mounting bracket should be moved counterclockwise to suit.

S8 - mounted on a bracket adjacent to S11, the switch is cam operated to remove the supply to the motor toward the limit of the drawer upward movement. The switch should operate when the T-bar is approximately ½ inch (1.27 cm) from the upper stop.

S9 - mounted adjacent to the lower mechanical stop the switch is drawer activated approximately ¼ inch (0.64 cm) before end of travel. The switch starts the digital timer.

S10 - mounted on the lower mechanical stop bracket adjacent to S9 the switch removes the motor supply in the event of a failure in S7.

S11 - mounted adjacent to, and connected in series with S8, the switch is provided as a safety feature. Should either S8 or S11 fail the other switch will stop the motor driving the drawer against the upper stop.

S14 - mounted on the top shielding plug the switch activates on the top surface of the drawer top when the shielding plug is closed.

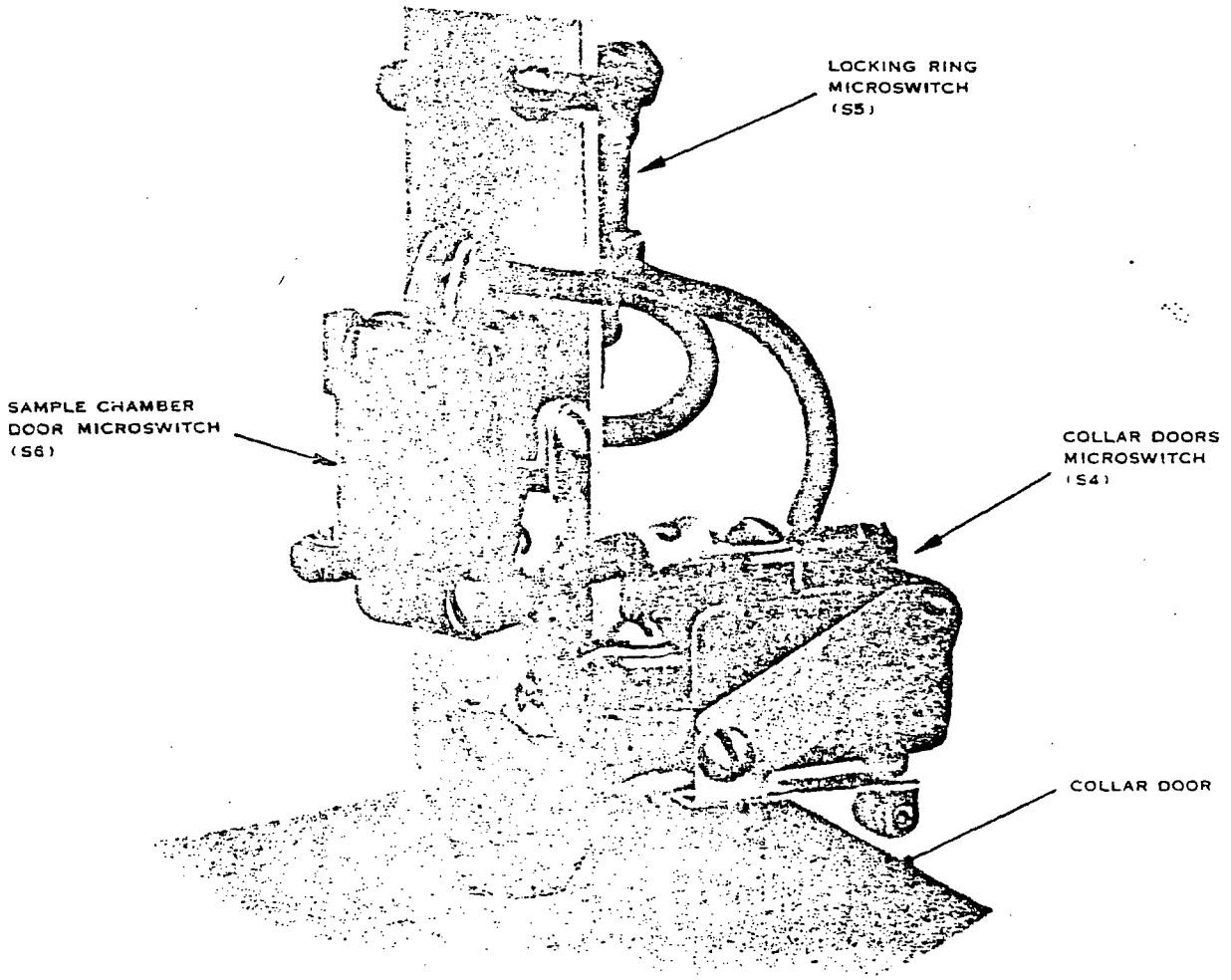
S15 - mounted on the right hand side of the unit and actuated by the elevating T-bar as it reaches the up position. This is a double pole microswitch S15A and is wired in series with S8 and S11 and limits the upward travel of the elevating T-bar by cutting the supply of power to the motor. S15B is wired normally open and is actuated by the elevating T-bar in the up position to supply power to the door interlock solenoid.

Switches S4, S5, S6 and S14 must be actuated before the motor will operate.

UNIT MOVEMENT

AECL recommends that the unit be put into the proper shipping mode as per our field manual "instructions for the preparation and shipping of a GC 220".

CAUTION: If for any reason the electrical supply is disconnected or changed, the motor rotation of the unit must be rechecked. This is accomplished by removing the V-belt and pressing the up button. The motor should rotate in a clockwise direction. If the rotation is counter clockwise, interchange two of the electrical leads.



COLLAR MICROSWITCH ASSEMBLY

FIGURE 9

PART 4

COMPONENT LOCATION

PART 4

COMPONENT LOCATION

PART 4

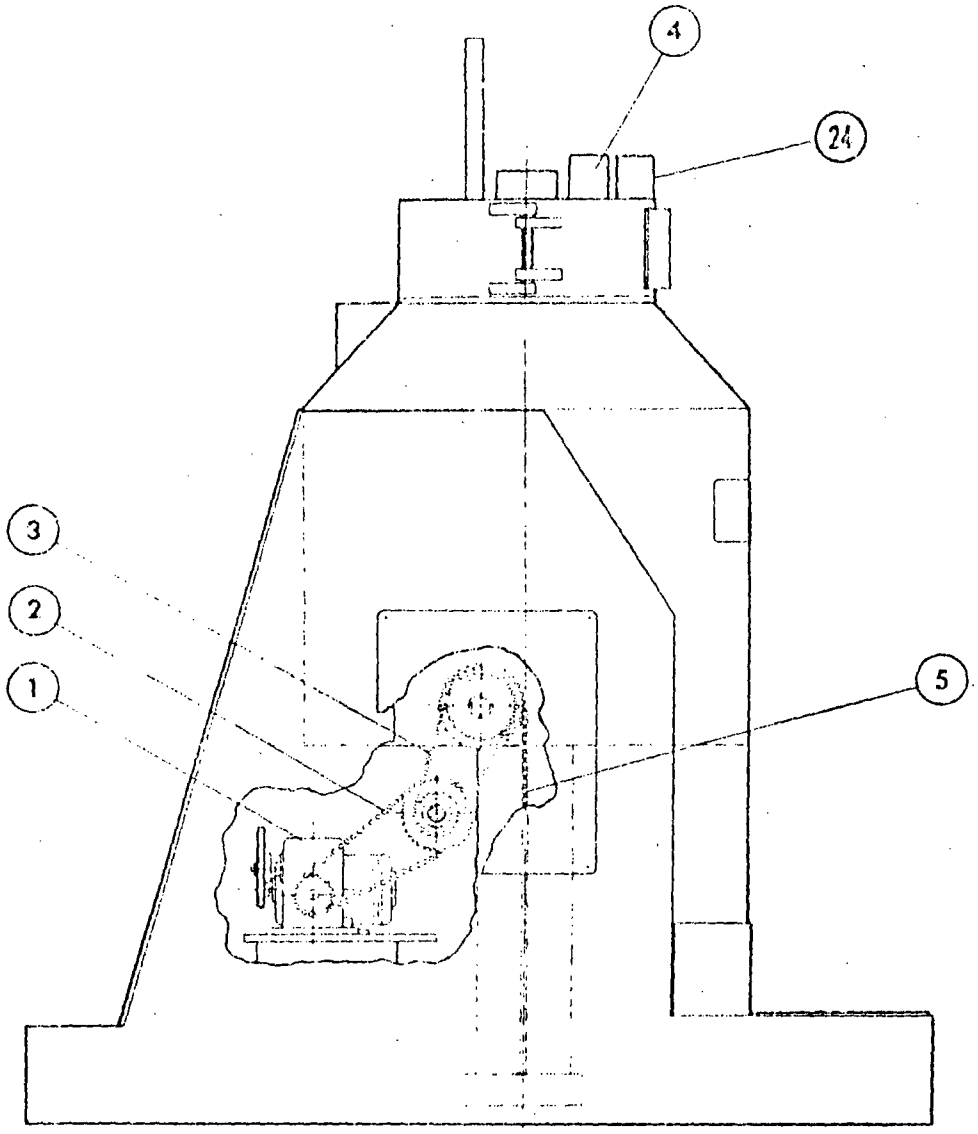
CONTAMINATION DETECTION

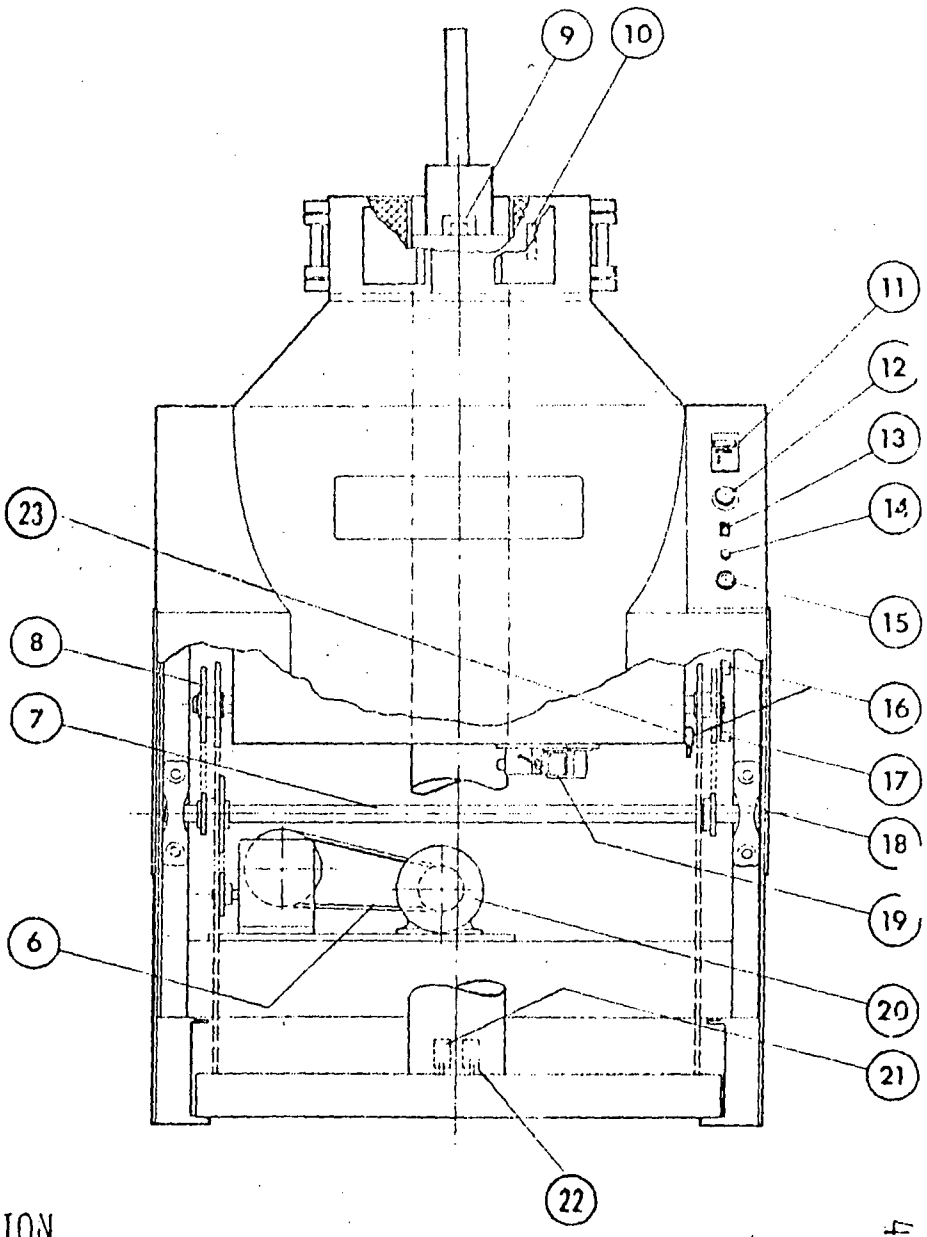
EXCERPT FROM TYPICAL LICENSE FOR BYPRODUCT MATERIALS

A. *Each sealed source containing byproduct material shall be tested for leakage and/or contamination at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, the sealed source shall not be used until tested.*

B. *The tests shall be capable of detecting the presence of 0.005 microcuries of contamination on the test sample. The test sample shall be taken from appropriate accessible surfaces of the device in which the sealed source is permanently or semi-permanently mounted or stored. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Pertinent Licensing Authority.*

C. *If the test reveals the presence of 0.05 microcuries or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five days of the test results, and the corrective action taken. A copy of*





COMPONENT LOCATION
FIGURE 10

PART 5

CONTAMINATION DETECTION

EXCERPT FROM U.S.N.R.C. LICENSE FOR BYPRODUCT MATERIALS

A. *Each sealed source containing byproduct material shall be tested for leakage and/or contamination at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, the sealed source shall not be used until tested.*

B. *The tests shall be capable of detecting the presence of 0.05 microcurie of contamination on the test sample. The test sample shall be taken from appropriate accessible surfaces of the device in which the sealed source is permanently or semipermanently mounted or stored. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Commission.*

C. *If the test reveals the presence of 0.05 microcurie or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five days of the test with the Director, Division of Materials Licensing, U.S. Nuclear Regulatory Commission, Washington, D.C., 20555, describing the equipment involved, the test results, and the corrective action taken. A copy of such report shall also be sent to the Director of the appropriate U.S. Nuclear Regulatory Commission, Regional Compliance Office listed in Appendix D of 10 C.F.R. 20.*

(A list of addresses is enclosed).

D. *Tests for leakage and/or contamination shall be performed by persons named in Condition 12 of the license or by persons specifically authorized by the Commission to perform such services.*

In countries other than the United States of America, the licensee should adhere to the regulations and conditions dictated by the local Atomic Energy Control Authority.

REMOVABLE CONTAMINATION TEST FOR A.E.C.L. EQUIPMENT CONTAINING COBALT 60 SOURCES

Wipe Test

The appropriate accessible surfaces of the device (*) in which the Cobalt 60 sources are permanently mounted shall be wiped thoroughly with a piece of filter paper of high wet strength and absorption capacity, which has been slightly moistened with water. The paper is allowed to dry and the radioactivity on the paper is then measured with an appropriate detector. If the measurement indicates the total activity removed to be less than 0.0005 microcurie the result is described as negative, i.e. no removable contamination is detected.

*Or "source capsule".

The above wipe test procedure is conducted by A.E.C.L. prior to shipment of the unit.

ROUTINE WIPE CONTAMINATION TEST

Method

1. To ensure that there is no loose contamination, two wipe tests will be taken on the machine using 3 inch filter paper of high wet strength moistened with water.
   (a) With the drawer in the load position, wipe the exposed outside surface of the irradiation chamber.
   (b) With the drawer in the irradiate position, wipe all the exposed lower surface of the drawer for a distance of 12 inches (30.5 cm) immediately below the bottom shielding.
2. Allow the paper to dry.
3. Count the wipes by placing in contact with a geiger counter operating in a background of no more than 100 counts per minute.
4. If the count recorded is equivalent to more than 0.005 microcuries of removable contamination report by mail to:

   Atomic Energy of Canada Limited
   P.O. Box 6300, Station J
   OTTAWA, Ontario K2A 3W3

If the count recorded is equivalent to more than 0.05 microcuries of removable contamination, suspend operation and advise the appropriate licensing body and A.E.C.L. refer Section C of "Excerpt from U.S.N.R.C. License for Cobalt 60".

5. The frequency of the above routine will be governed by the appropriate State of Federal Government Agency, but in any case it is recommended that it be carried out at least once every six months.

TABLE I

USNRC REGIONAL OFFICES

HEAD OFFICE

Director,
Office of Inspection and Enforcement,
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

REGIONS	OFFICE ADDRESS	TELEPHONE NO.
Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania Rhode Island, and Vermont	Region I, the USNRC Office of Inspection and Enforcement, 631 Park Avenue, King of Prussia, PA 19406	(215) 337-1150 (215) 337-1150
Alabama, Florida, Georgia Kentucky, Mississippi, North Carolina, Panama Canal Zone, Tennessee, Virginia, Virgin Islands, and West Virginia	Region II, USNRC Office of Inspection and Enforcement, 101 Marietta St., N.W. Suite 2900 Atlanta, GA 30323	(404) 221-4503 (404) 221-4503
Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.	Region III, USNRC Office of Inspection and Enforcement, 799 Roosevelt Road, Glen Ellyn, Ill. 60137	(312) 790-5500 (312) 790-5500
Arkansas, Colorado, Idaho, Kansas, Louisiana, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, and Wyoming	Region IV, USNRC Office of Inspection and Enforcement, 611 Ryan Plaza Drive Suite 1000 Arlington, Texas 76012	(817) 860-8100 (817) 860-8100
Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washingtonf, and U.S. Territories, and possessions in the Pacific	Region V, USNRC Office of Inspection and Enforcement 1450 Maria Lane, Suite 210 Walnut Creek, CA 94596	(415) 943-3700 (415) 943-3700

'Nights and Holidays

TABLE 2

CANADIAN N.H.&W., R.P.B.
FEDERAL AND PROVINCIAL OFFICES

REGIONS	OFFICE ADDRESS	TELEPHONE NO.
National	Radiation Protection Bureau Brookfield Road Ottawa, K1A 1C1, Ontario.	(613) 998-4614 (24 hours)
Newfoundland	Assistant Deputy Minister of Health Department of Health St. John's, Newfoundland	(709) 722-0711
Prince Edward Island	Division of Cancer Control Department of Health P.O. Box 3000 Charlottetown, P.E.I.	(902) 892-3577
Nova Scotia	Consultation Services Department of Health P.O. Box 488 Halifax, Nova Scotia	(902) 424-7571
New Brunswick	Radiation Protection Officer Department of Health Fredericton, N.B.	(506) 453-2542
Quebec	Division of Industrial Hygiene Ministry of Municipal Affairs and Environment 9310 St. Laurent Boulevard Montreal, P.Q.	(514) 873-3454
Ontario	Senior Consultant, Health Physics Community Health Standards Division Ontario Ministry of Health 15 Overlea Boulevard Toronto, Ontario	(416) 965-8178
Manitoba	Co-Ordinator, Radiation Protection Department of Mines, Research & Environmental Management Box 7, 139 Tuxedo Avenue Winnipeg, Manitoba	(204) 489-4511

REGIONS	OFFICE ADDRESS	TELEPHONE NO.
Manitoba	Radiation Protection Section Physics Department Manitoba Cancer Treatment & Research Foundation 700 Bannatyne Avenue Winnipeg 3, Manitoba	(204) 786-4731
Saskatchewan	Occupational Health Division Department of Labour Regina, Saskatchewan.	(306) 265-4538
Alberta	Industrial Health Services Division Alberta Health & Social Development 10523-100 Avenue Edmonton, Alberta	(403) 427-2691
British Columbia	Occupational Health Division Department of Health Services & Hospital Insurance 828 West Tenth Avenue Vancouver 9, B.C.	(604) 874-2331

HEALTH PHYSICS
WALTER REED ARMY MEDICAL CENTER
Washington, D.C. 20012

SOP Number

OPERATING AND SAFETY PROCEDURES FOR AECL GAMMACELL 40 IRRADIATOR

1. GENERAL

a. The Gammacell 40 (GC-40) shall be used (operated) by, or under the direct supervision of individuals designated by the Walter Reed Army Medical Center (WRAMC) Radiation Control Committee, Deputy Commander, WRAMC, Chairman.

b. The authorized Principal User is directly responsible for the control and safe use of this irradiator and will designate individuals to operate the GC-40 as approved by the WRAMC Radiation Control Committee.

c. The GC-40 shall be used for medical research and development in radiation biology and radiation dosimetry.

2. DEFINITIONS

Because the precise meaning given to one or more critical terms frequently determines the interpretation of a statement, the following definitions are given for certain words and phrases as they are used in this document:

a. "Shall" - denotes that the ensuing recommendation is necessary or essential to meet the currently accepted standards of radiation protection.

b. "Should" (is recommended) - indicates advisory recommendations that are to be applied when practicable.

c. "Explosive" - explosives are either solid or liquid, either mixtures or single compounds, and act by explosive chemical reaction, liberating at high speed heat and gas, which causes tremendous pressure.

d. "Flammable" - materials capable of being easily ignited; preferred to "inflammable", because of possible ambiguity of the in prefix.

e. "Individual" and/or "Operator" - a person designated by the authorized Principal User, as approved by the WRAMC Radiation Control Committee, to operate the AECL Gammacell 40 Irradiator.

f. "Emergency" - an unforeseen combination of circumstances (e.g., failure of an interlock or safety device, fire, ruptured or leaking source, etc.) that pose a threat to personnel or property by ionizing radiation.

3. RESPONSIBILITIES

a. The authorized Principal User:

(1) Ensuring that the GC-40 is operated only by individuals authorized to do so by the WRAMC Radiation Control Committee, and in accordance with the conditions of the WRAMC Radioactive Material authorization.

(2) Instruction of individuals in safe operating procedures in accordance with instructions outlined herein. He shall promulgate rules for working safety, including any restrictions of the operating technique known to be necessary.

(3) Ensuring that these instructions and references contained in para 7 are available at the GC-40 unit at all times.

(4) Promptly reporting any source malfunction, accident, or other unplanned occurrence that could result in an unsafe condition or exposure to personnel to the WRAMC Health Physics Officer (301-427-5107).

(5) Assuring that all personnel operating the unit are monitored by appropriate personnel monitoring devices.

(6) Ensuring that personnel operating the unit have been instructed in the hazards and nature of injuries resulting from overexposure to ionizing radiation (e.g., attendance at appropriate WRAMC personnel training programs - HSWP-QHP Memo No. 2)

b. WRAMC Health Physics:

(1) Conducting routine radiation protection surveys and inspections.

(2) Providing technical assistance as required.

(3) Providing calibration and routine maintenance services for radiation detection and measuring instruments.

c. Individual Operators:

(1) Operating the unit in accordance with the operation and safety procedures delineated in this SOP.

(2) Recording all pertinent information in the operating log maintained by the authorized Principal User.

(3) Being familiar with the content of these instructions, requirements of the WRAMC authorization, and other regulations as may be prescribed by the authorized Principal User.

(4) Locking the GC-40 unit and the room upon completion of use.

(5) Ensuring that the keys to the unit and the room door are properly secured to prevent unauthorized use.

(6) Reporting all malfunctions, accidents, and any other unplanned occurrence that could result in an unsafe condition or exposure of personnel promptly to the authorized Principal User.

4. OPERATION PROCEDURES

a. Insert key in the keyswitch and turn clockwise to the ON position.

b. Open the sample cavity door by holding in the door lock pushbutton and pulling on the door handle.

c. Remove the sample tray by pushing up from the underside.

d. Place the object to be irradiated in the sample tray and cover with the lid.

e. Replace the sample tray in the sample cavity ring.

f. "Chamber Air" - if ventilation to the sample cavity is required, press the "Chamber Air" button on the control panel which will illuminate white when ventilation air supply is on.

g. Close the sample cavity door and lock making sure it latches.

h. If automatic operation is desired:

(1) Press the Manual/Auto selector switch until the Auto portion of the switch is illuminated.

(2) Set the desired time interval on the timer counter. This is achieved by holding in the red reset button located at the left of the digit windows, and depressing the timer selector buttons until the desired numerals appear. Release the red button.

(3) Press the "Source on" pushbutton, both sources will move to the irradiate position and the timer will start. At the end of the preset time the source drawers will automatically move to their fully shielded safe storage position.

i. If manual operation is desired press the Manual/Auto selector switch until the manual portion of the switch is illuminated, then press the "Source On" pushbutton. The sources will remain in the irradiate position until the "Source Off" switch is operated.

5. SAFETY FEATURES

Several safety features have been incorporated into the unit for the protection of operating personnel:

a. The source drawers are mechanically interlocked with the sample cavity door to ensure that:

(1) The sample cavity door cannot be opened when the source drawers are in the irradiate position.

(2) The source drawers cannot move into the irradiate position when the sample cavity door is open, or is not completely closed.

b. The mechanical lock on the sample cavity door is electrically interlocked to prevent the door from being opened when either source is not in its fully shielded safe storage position.

c. In the event of a power failure occurring during an irradiation, the source drawers will automatically return to the safe position. After power is restored, the "Source On" pushbutton must be pressed to continue the irradiation.

d. A pressure sensing switch is incorporated in the pneumatic system which will cause the source drawers to return to the safe position if the air pressure drops below 40 psig. Should this situation occur, the Low Air Indicator lamp on the control panel will be illuminated.

6. SAFETY/EMERGENCY PROCEDURES

a. The GC-40 shall be operated as described in the Atomic Energy of Canada Limited "Instruction Manual Gammacell 40 Caesium 137 Irradiation Unit," edition No. 3, September 1977, and in accordance with this Standing Operating Procedure.

b. Emergency Procedures: See Annex A of this Standing Operating Procedure.

c. No individual shall undertake repair, perform any maintenance, remove any interlock and/or safety device, or make any changes in and/or on the GC-40 without prior approval of the authorized Principal User and the Health Physics Officer, WRAMC.

d. Under NO circumstances shall explosive material be irradiated in the GC-40.

e. All operators and/or assistants shall wear personnel monitoring devices while working around and/or operating the GC-40 irradiator.

f. Health Physics, WRAMC, will perform leak tests, periodic inspections and radiation protection surveys.

g. An operating log shall be maintained by the authorized Principal User.

h. Key Control:

(1) Operating keys will be held under direct supervision of the authorized Principal User approved by the WRAMC Radiation Control Committee. The Principal User is responsible for asssuring proper key control and key security.

(2) Duplicate keys for the GC-220 and GC-40 will be secured by the authorized Principal User.

7. RERFERENCES

a. Atomic Energy of Canada Limited "Instruction Manual Gammacell 40 Cesium 137 Irradiation Unit," edition No. 3, September 1977.

b. Nuclear Regulatory Commission By-Product Material License No. 08-01738-03.

1 Incl
ANNEX A - Emergency Procedures
for AECL Gammacell
40 Irradiator

ANNEX A to Health Physics SOP Number

EMERGENCY PROCEDURES
FOR
AECL GAMMACELL 40 IRRADIATOR

1. In the event of an emergency, malfunction, or other unusual occurrence, the following individuals shall be notified after pressing the "Source Off" switch:

a. Authorized Principal User, USAMRIID, Extension 7241.

b. Health Physics Officer, WRAMC, Phone 301-427-5107.

c. Safety Officer, USAMRIID, Extension 7373.

d. Staff Duty NCO, USAMRIID (after duty hours), Extension 7335.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority.

2. In the event of fire the following individuals shall be notified:

a. Fire Department, Fort Detrick, Extension 7333.

b. Authorized Principal User, USAMRIID, Extension 7241.

c. Health Physics Officer, WRAMC, Phone 301-427-5107.

d. Safety Officer, USAMRIID, Extension 7373.

e. Staff Duty NCO, USAMRIID (after duty hours), Extension 7335.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority. Fire fighters may enter the area after the radiation hazard has been determined. There is little likelihood of radiation hazard unless the temperature of the source shield reaches the melting point of lead (621°F). Water should be sprayed on the source shield if there is any possibility of the temperature approaching this value.

3. Following an emergency the GC-40 shall not be operated until an inspection and a radiation protection survey have been conducted by WRAMC Health Physics.

ANNEX A to Health Physics SOP Number

EMERGENCY PROCEDURES
FOR
AECL GAMMACELL 40 IRRADIATOR

1. In the event of an emergency, malfunction, or other unusual occurrence, the following individuals shall be notified after pressing the "Source Off" switch:

a. Authorized Principal User, WRAIR, Extension 576-3428.

b. Radiation Protection Officer, WRAIR, Extension 576-3428.

c. Health Physics Officer, WRAMC, Extension 301-427-5107.

d. Staff Duty Officer, WRAMC (after duty hours), Extension 576-3501/2309.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority.

2. In the event of a fire, the following individuals shall be notified:

a. Fire Department, WRAMC, Extension 576-3317.

b. Authorized Principal User, WRAIR, Extension 576-3428.

c. Radiation Protection Officer, WRAIR, Extension 576-3428.

d. Health Physics Officer, WRAMC, Extension 301-427-5107.

e. Staff Duty Officer, WRAMC (after duty hours), Extension 576-3501/2309.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority. Fire fighters may enter the area after the radiation hazard has been determined. There is little likelihood of radiation hazard unless the temperature of the source shield reaches the melting point of lead (621°F). Water should be sprayed on the source shield if there is an possibility of the temperature approaching this value.

3. Following an emergency the GC-40 shall not be operated until an inspection and a radiation protection survey have been conducted by WRAMC Health Physics

INSTRUCTION MANUAL

GAMMACELL 40
CAESIUM 137 IRRADIATION UNIT

EDITION NO. 3, SEPTEMBER 1977

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
OTTAWA, CANADA

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LIST OF ILLUSTRATIONS

TABLES

PART 1

DESCRIPTION

GENERAL

The Gammacell 40 is a Caesium 137 irradiation unit manufactured by Atomic Energy of Canada Limited and is designed for use in an unshielded room. The unit provides a means for uniform gamma irradiation of small animals or biological samples while providing complete protection for operating personnel. Figure 1 illustrates the general features and dimensions of the unit.

A Caesium 137 double encapsulated source is housed in each of two cylindrical sliding drawers, one above and one below the sample cavity. The source drawers are moved from the shielded position to the irradiate position by pneumatic cylinders.

The sample cavity consists of an aluminum ring 13.0 in (33.02 cm) inside diameter x 4.875 in (12.38 cm) deep. The cavity is open at the top and bottom and has hanger slots in the top rim from which to suspend the sample tray. The ring is secured to a hinged door such that when opened, the sample tray swings out with the door and is easily accessible without reaching into the irradiation cavity.

A plastic sample tray with lid and supports for use in the sample cavity is provided with the unit. The internal

dimensions of the tray are 12 in (30.5 cm) diameter by 4.13 in (10.5 cm) deep. The sample tray has ventilation holes in its side which align with ventilation ports through the main shield.

Three stainless steel access tubes 0.375 in (0.95 cm) inside diameter are provided which lead into the sample cavity. Two of these tubes pass through the sample cavity door and can be used for instrumentation. The remaining tube passes through the fixed shield and is used for cavity ventilation.

The sourcehead pneumatic cylinders and controls are entirely covered by a removable sheet metal enclosure consisting of upper and lower enclosures with inspection covers and two end panels. The upper enclosure contains the control panel.

ELECTRICAL POWER REQUIREMENTS

a) Standard Unit

The standard unit requires a power supply of 110/120 VAC, 60 Hz, single phase, 2 kVa. Fusing and wiring must be adequate for a 1/2 HP motor load. The circuit used to power the unit must have sufficient capacity to prevent release of relays in the unit caused by voltage drop when the compressor motor starts. An ON/OFF circuit switch in the immediate vicinity of the unit is recommended.

b) Optional Power Supply

Some units are supplied to operate on 220/230 VAC, 50 Hz, single phase power supply.

c) Power Cable

Where local electrical codes permit, the unit may be plugged into a suitable wall receptacle. A 10 ft (3 m) power cable with a three-prong plug is provided for this purpose.

AIR COMPRESSOR

An air compressor, complete with reservoir tank, provides air for both drawer movement and sample cavity ventilation. The compressor is driven by a 1/2 HP motor.

The air is filtered, regulated and lubricated at a panel mounted under the sheet metal on the right hand side of the unit. Plastic tubing provides connection to the cavity access tube through which filtered, unlubricated, controlled air is bled into the sample cavity for ventilation purposes. The manual air valve has been adjusted to allow for a slow flow of air into the cavity. A solenoid valve operated by a switch on the control panel will switch the air on or off. The manual air valve should not need re-adjusting, however if adjusted, keep the ventilation air supply well below that of the air compressor as a drop in pressure will impede the operation of the source drawers.

SEALED SOURCES

The doubly encapsulated Caesium 137 source capsules, (C-161, Type 8) are mounted in brass encased lead filled horizontal cylinders, 2.5 in (6.35 cm) diameter and 16.0 in (40.64 cm) long and are held in place by Truarc retaining rings (one to each capsule).

SAMPLE CAVITY DOOR

The sample cavity door is a steel encased, lead filled segment of the cylindrical shield which is attached by hinges to the fixed shielding. The sample cavity ring is mounted on the inner curved surface of the sample cavity door. The sample cavity door has a mechanical lock which is electrically interlocked when either source is not in its safe storage position.

CONTROL PANEL

The control panel is secured to the upper sheet metal cover with four machine screws. The electrical wiring plugs into the back of the panel.

(Refer to Figure 1) Reading from left to right, top row first, the controls are:

1. Keyswitch - to control the electrical supply to the unit.
2. "Manual/Auto" Mode Switch - a split window, alternate action, illuminating pushbutton switch. The lower half illuminates blue (Automatic); the upper half illuminates white (Manual).
3. "Timer" Assembly - a digital timer of the manual reset type which will accommodate a timed operation of up to 9999.9 minutes duration. A pushbutton switch is provided immediately below each digit window to control setting adjustments. A timer reset pushbutton is located on the left side of the windows. Momentary actuation of the reset pushbutton will reset the timer for repeat irradiations.

4. "Source On" Switch - an illuminated pushbutton switch to control the movement of the source drawers to the "irradiate" position. The screen illuminates red to indicate that both source drawers have moved from the safe position.
5. "Source Off" Switch - an illuminated pushbutton switch to control the movement of the source drawers to the safe position. The screen illuminates green in two halves to indicate that both source drawers have moved from the irradiate position.

NOTE: Both the "Source On" and "Source Off" lamps are illuminated during the period that the source drawers are travelling. Only the red or green pushbuttons remain illuminated when the drawers complete their travel and these screens indicate the position of the source. The drawers do not necessarily travel in unison, one may complete its travel before the other one moves.

6. "Low Air/Timer On" Indicator Lamp - a split window press-to-test type indicator. The lower half illuminates red to indicate a low pressure condition. In this event the source drawers will automatically return to the safe position. The upper half illuminates blue to indicate that the timer is running.
7. "Chamber Air" Switch - an alternate action illuminating pushbutton switch. The screen indicates white when air is being used for sample cavity ventilation purposes.

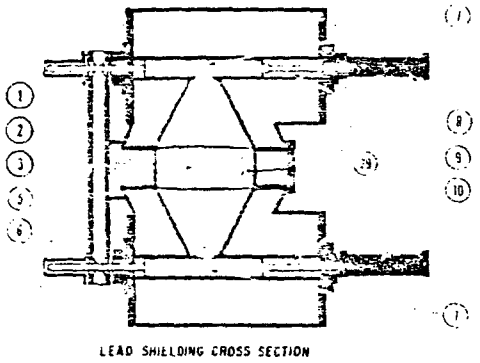
SAFETY FEATURES

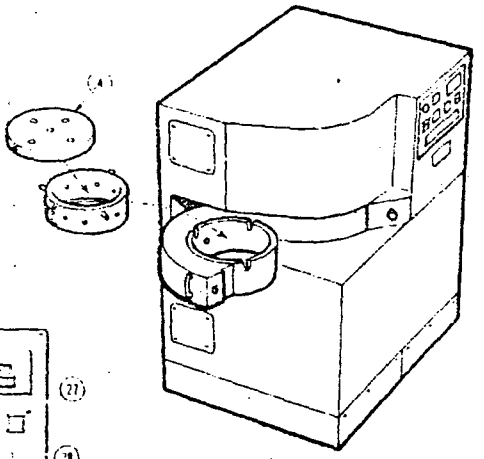
Several safety features have been incorporated into the unit for the protection of operating personnel:

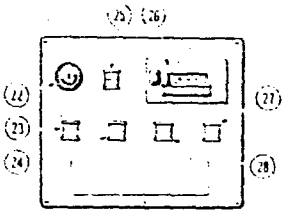
1. The source drawers are mechanically interlocked with the sample cavity door. A square section steel rod is mounted on the front of each source drawer which will only pass through slots in tubular extensions of the sample cavity door hinge pin when the door is closed. This ensures that:
   a) The sample cavity door can not be opened when the source drawers are in the irradiate position.
   b) The source drawers can not move into the irradiate position when the sample cavity door is open, or is not completely closed.
2. The mechanical lock on the sample cavity door is electrically interlocked to prevent the door from being opened when either source is not in its fully shielded safe storage position.

WEIGHTS

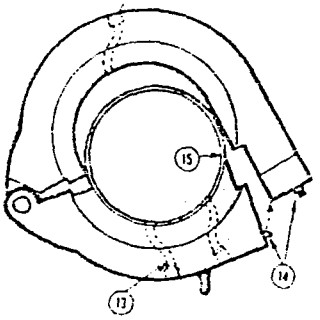
The Gammacell 40 weighs approximately 6300 lb (2858 kg) when assembled in its operating configuration. Crated weight is in the region of 6500 lb (2948 kg).

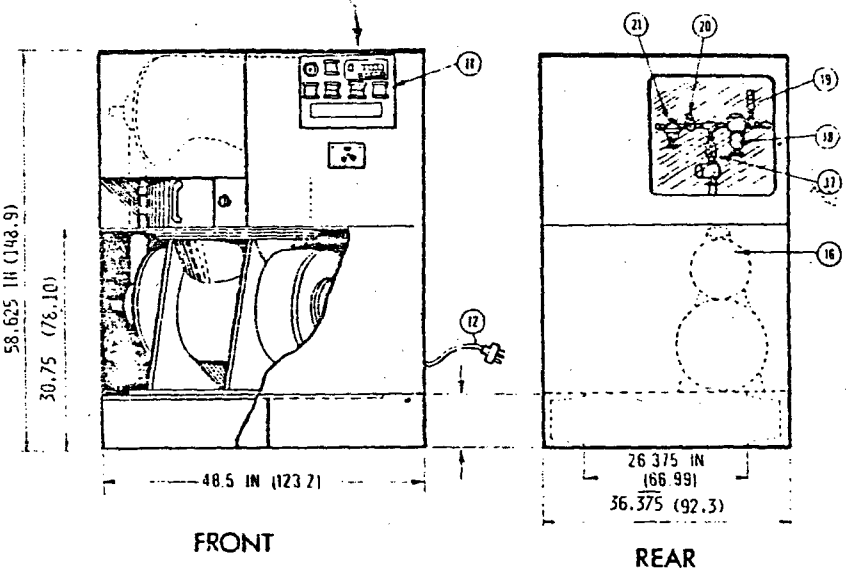






3/8 IN 9 UNC X 1.0 IN (2.54CM)
TAPPED HOLES (3)





NOTE: DIMENSIONS IN BRACKETS ARE CENTIMETERS.

PARTS LIST

1 MECHANICAL INTERLOCK (UPPER)
2 ATTENUATOR (UPPER)
3 SAMPLE CAVITY
15.0 IN (35.0 cm) DIA x 8.87 IN (22.37 cm) DEEP
4 SAMPLE DRAWER TRAY (ABS PLASTIC)
5 ATTENUATOR (LOWER)
6 MECHANICAL INTERLOCK (LOWER)
7 SOURCE "ON" POSITION
8 SOURCE DRAWER CYLINDER (UPPER)
9 SOURCE "OFF" POSITION
10 SOURCE DRAWER CYLINDER (LOWER)
11 CONTROL PANEL
12 POWER CABLE [illegible]
13 ACCESS/VENTILATION TUBE (3)
14 SAMPLE DRAWER LOCK
15 SAMPLE CHAMBER CAVITY RING
16 AIR COMPRESSOR & STORAGE TANK WITH GAUGE
17 PRESET VENTILATION VALVE
18 FILTER
19 PRESSURE SENSING SWITCH
20 AIR PRESSURE REGULATOR AND GAUGE
21 LUBRICATOR
22 POWER ON/OFF KEY SWITCH
23 SOURCE "ON" PUSHBUTTON SWITCH
24 SOURCE "OFF" PUSHBUTTON SWITCH
25 MANUAL/AUTO SELECTOR PUSHBUTTON SWITCH
26 DIGITAL TIMER
27 CHAMBER AIR ILLUMINATED PUSHBUTTON
28 TIMER ON/LOW AIR INDICATOR LAMP
29 SAMPLE CAVITY COLLIMATOR - REF: AECL PRODUCT NO. 10-059. (OPTIONAL NOT ILLUSTRATED)

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
P.O. BOX 6300 Postal Station C OTTAWA, CANADA.

TITLE
GAMMACELL 40
GENERAL DIMENSION LAYOUT

REF DWG [illegible]
REVISED MAY 1976
DATE [illegible]
No. J1000-X-1
REV. D
DRAWN
CHECKED
APPROVED
SHEET 1 OF 1

PART 2

OPERATION

AUTOMATIC OPERATION

1. Insert key in the keyswitch and turn clockwise to the ON position.
2. Open the sample cavity door by holding in the door lock pushbutton and pulling on the door handle.
3. Remove the sample tray by pushing up from the underside.
4. Place the object to be irradiated in the sample tray and cover with the lid.
5. Replace the sample tray in the sample cavity ring.
6. "Chamber Air" - if ventilation to the sample cavity is required, press the "Chamber Air" button on the control panel which will illuminate white when ventilation air supply is on.
7. Close the sample cavity door and lock making sure it latches.
8. Press the Manual/Auto selector switch until the Auto portion of the switch is illuminated.
9. Set the desired time interval on the timer counter. This is achieved by holding in the red reset button located at the left of the digit windows, and depressing the timer selector buttons until the desired numerals appear. Release the red button.
10. Press the "Source On" pushbutton, both sources will move to the irradiate position and the timer will start. At

the end of the preset time the source drawers will automatically move to their fully shielded safe storage position.

NOTE: If it is required to open the sample cavity door during a timed irradiation, the sources must be returned to their safe positions. The timer will store the remaining portion of the preset time until the operation is resumed.

MANUAL OPERATION

1. For the initial steps refer to Automatic Operation, steps 1 to 7 inclusive.
2. Press the Manual/Auto selector switch until the manual portion of the switch is illuminated.
3. Press the "Source On" pushbutton. The sources will remain in the irradiate position until the "Source Off" switch is operated.

POWER FAILURE

In the event of a power failure occurring during an irradiation, the source drawers will automatically return to the safe position. After power is restored the "Source On" pushbutton must be pressed to continue the irradiation.

AIR PRESSURE FAILURE

A pressure sensing switch is incorporated in the pneumatic system which will cause the source drawers to return

to the safe position if the air pressure drops below 40 psig. Should this situation occur, the Low Air indicator lamp on the control panel will be illuminated.

PART 3

MAINTENANCE AND SERVICE

ELECTRICAL DRAWINGS

A set of pertinent electrical drawings is supplied with each unit to enable the customer to correct minor electrical problems.

SLIDING SOURCE DRAWERS

In the unlikely event that either source drawer should malfunction, no remedial action shall be taken by the responsible user of the equipment. Since the sealed source(s) is inherently shielded during all modes of operation, no personnel hazard is possible.

If such malfunction occurs, operations should be suspended and the Installation and Services Department of AECL should be notified immediately as to the nature of the incident. AECL, or their Agent, will assess the situation and take what action they deem necessary to remedy the fault and re-commission the unit.

Such services as are rendered in this regard may incur additional charges to the customer in accordance with the terms of the contract to purchase and/or warranty.

GENERAL

The following equipment inspection and maintenance procedures are those considered to be the minimum necessary

for continuing efficient operation of the unit. Frequency of application will be governed by individual requirements and users experience.

Inspection covers in the sheet metal are provided at each source drawer mechanical interlock position (2) and the pneumatic control panel.

The upper and lower sheet metal covers and two back panels are also removable, providing access to the internal components. It is advisable to disconnect the power supply before removing the main sheet metal. It is necessary to remove the control panel before removing the upper sheet metal cover. The control panel is secured by four machine screws. When the four machine screws are removed the electrical wiring can be unplugged from the back of the panel. The right hand side panels and skirt covers must be taken off before the upper and lower main covers can be removed.

WEEKLY

PNEUMATIC SYSTEM

1. Check for air and oil leaks.
2. Drain residue from the air filter by opening the drain valve on the filter bowl.
3. Check the oil level in the air line lubricator. If necessary refill with SAE 10 regular motor oil (non-detergent).

6 MONTHLY

Drain water from the compressor reservoir tank by opening the drain valve located on the underside of the tank. The compressor is located under the sheet metal covers at the back right hand side and access can be obtained by removing the lower side panel.

In humid locations, it may be necessary to drain more frequently.

PART 4

CONTAMINATION DETECTION

EXCERPT FROM TYPICAL LICENSE FOR BYPRODUCT MATERIALS

A. *Each sealed source containing byproduct material shall be tested for leakage and/or contamination at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, the sealed source shall not be used until tested.*

B. *The tests shall be capable of detecting the presence of 0.05 microcuries of contamination on the test sample. The test sample shall be taken from appropriate accessible surfaces of the device in which the sealed source is permanently or semi-permanently mounted or stored. Records of leak test results shall be kept in units of microcuries and maintained for inspection by the Pertinent Licensing Authority.*

C. *If the test reveals the presence of 0.05 microcuries or more of removable contamination, the licensee shall immediately withdraw the sealed source from use and shall cause it to be decontaminated and repaired or to be disposed of in accordance with Commission regulations. A report shall be filed within five days of the test results, and the corrective action taken. A copy of*

such report shall also be sent to the Director of the appropriate Regional Compliance Office listed in this Part of the Instruction Manual.

NOTE ON MEASUREMENT

1. Tests for leakage and/or contamination shall be performed by persons named in the Conditions of the license or by persons specifically authorized by the Pertinent Licensing Authority to perform such services.
2. Tests should be made with equipment comparable to the BERTHOLD RATO/F Survey Meter as used by the Installation and Services Department of AECL.
   The BERTHOLD RATO/F Meter has been calibrated against an AECL standard ^{137}Cs source. Using the 3 inch filter paper(s) recommended for wipe testing ^{137}Cs sources, a scale reading of 210 counts per minute (cpm) above background is equal to 0.05 microcuries of contamination (see Excerpt B).
3. The licensee should adhere to the regulations and conditions dictated by the local Atomic Energy Control Authority.

REMOVABLE CONTAMINATION TEST FOR AECL EQUIPMENT CONTAINING CAESIUM 137 SOURCES

Wipe Test

The appropriate accessible surfaces of the device (*) in which the sources are permanently or semi-permanently

* Or "source capsule".

mounted shall be wiped thoroughly with a piece of filter paper of high wet strength and absorption capacity, which has been slightly moistened with water. The paper is allowed to dry and the radioactivity on the paper is then measured with an appropriate detector. If the measurement indicates the total activity removed to be less than 0.005 microcuries the result is described as negative, i. e. no removable contamination is detected.

NOTE ON MEASUREMENT

Tests are made with equipment comparable to the BERTHOLD RATO/F Survey Meter (as used by the Service Department of AECL) which has been calibrated to AECL standards. (See Note 2, Excerpt from Typical License for Byproduct Materials.)

The above wipe test procedure is conducted by AECL prior to shipment of the unit.

ROUTINE WIPE CONTAMINATION TEST

METHOD:

1. Open sample cavity door.
2. Using 3 inch filter paper of high wet strength and absorption capacity moistened with water, perform a wipe test on the accessible portion of the perimeter of the upper attenuator (see Figure 1).
3. Allow the wipe samples to dry.
4. Remove the upper and lower inspection covers on the left hand side of the sheet metal enclosure.

5. Using more filter papers moistened with water, perform wipe tests around the source drawer mechanical interlocks for both the upper and lower sources. (See Figure 1).

6. Allow wipe samples to dry.

7. Count all wipe samples by placing in contact with a survey meter operating in a background field of not more than 0.25 mrh.

NOTE ON MEASUREMENT

Tests should be made with equipment comparable to the BERTHOLD RATO/F Survey Meter as used by the Installation and Services Department of AECL.

The BERTHOLD RATO/F Meter has been calibrated against an AECL standard ^{137}Cs source. Using the 3 inch filter paper(s) recommended for wipe testing ^{137}Cs sources, a scale reading of 210 counts per minute (cpm) above background is equal to 0.05 microcuries of contamination (see Excerpt B).

8. If the count recorded exceeds 100 cpm, report to:

Atomic Energy of Canada Limited, Commercial Products,
P. O. Box 6300, Postal Station "J",
OTTAWA, Ontario, Canada. K2A 3W3

9. If the count recorded exceeds 210 cpm (0.05 microcuries of removable contamination) suspend operations and advise the Appropriate Licensing Authority and AECL.

10. Replace all sheet metal enclosures.

11. The frequency of the above routine will be governed by the appropriate Agreement State or Federal Government Agency, but in any case it is recommended that it be carried out at least once every six months.

TABLE I

USAEC REGIONAL OFFICES

HEAD OFFICE

Director,
Division of Materials Licensing
U.S. Atomic Energy Commission,
Washington, D.C. 20545

REGIONS	OFFICE ADDRESS	TELEPHONE NO.
Connecticut, Delaware, District of Columbia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania Rhode Island, and Vermont	Region I, the USNRC Office of Inspection and Enforcement, 631 Park Avenue, King of Prussia, PA 19406	(215) 337-1150 (215) 337-1150
Alabama, Florida, Georgia Kentucky, Mississippi, North Carolina, Panama Canal Zone, Tennessee, Virginia, Virgin Islands, and West Virginia	Region II, USNRC Office of Inspection and Enforcement, 101 Marietta St., N.W. Suite 2900 Atlanta, GA 30323	(404) 221-4503 (404) 221-4503
Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin.	Region III, USNRC Office of Inspection and Enforcement, 799 Roosevelt Road, Glen Ellyn, Ill. 60137	(312) 790-5500 (312) 790-5500
Arkansas, Colorado, Idaho, Kansas, Louisiana, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah, and Wyoming	Region IV, USNRC Office of Inspection and Enforcement, 611 Ryan Plaza Drive Suite 1000 Arlington, Texas 76012	(817) 860-8100 (817) 860-8100
Alaska, Arizona, California, Hawaii, Nevada, Oregon, Washingtonf, and U.S. Territories, and possessions in the Pacific	Region V, USNRC Office of Inspection and Enforcement 1450 Maria Lane, Suite 210 Walnut Creek, CA 94596	(415) 943-3700 (415) 943-3700

'Nights and Holidays

TABLE 2

CANADIAN N. H. AND W., R. P. B.
FEDERAL AND PROVINCIAL OFFICES

REGIONS	OFFICE ADDRESS	TELEPHONE NO.
National	Inter-Agency Committee on Radiation Accidents, Brookfield Road, Ottawa 8, Ontario	(613) 998-4614 (24 hours)
Newfoundland	Assistant Deputy Minister of Health, Department of Health, St. John's, Newfoundland	(709) 722-0711
Prince Edward Island	Division of Cancer Control, Department of Health, P. O. Box 3000, Charlottetown, P. E. I.	(902) 892-3577
Nova Scotia	Consultation Services, Department of Health, P. O. Box 488, Halifax, Nova Scotia	(902) 424-4425
New Brunswick	Radiation Protection Officer, Department of Health, Fredericton, N. B.	(506) 453-2067
Quebec	Division of Industrial Hygiene, Ministry of Municipal Affairs and Environment, 9310 St. Laurent Boulevard, Montreal, P. Q.	(514) 873-3454
Ontario	Senior Consultant, Health Physics, Community Health Standards Division, Ontario Ministry of Health, 15 Overlea Boulevard, Toronto, Ontario	(416) 965-8178
Manitoba	Co-Ordinator, Radiation Protection, Department of Mines, Research and Environmental Management, Box 7, 139 Tuxedo Avenue, Winnipeg, Manitoba	(204) 489-4511

TABLE 2

CANADIAN N. H. AND W., R. P. B.
FEDERAL AND PROVINCIAL OFFICES

REGIONS	OFFICE ADDRESS	TELEPHONE NO.
National	Inter-Agency Committee on Radiation Accidents, Brookfield Road, Ottawa 8, Ontario	(613) 998-4614 (24 hours)
Newfoundland	Assistant Deputy Minister of Health, Department of Health, St. John's, Newfoundland	(709) 722-0711
Prince Edward Island	Division of Cancer Control, Department of Health, P. O. Box 3000, Charlottetown, P. E. I.	(902) 892-3577
Nova Scotia	Consultation Services, Department of Health, P. O. Box 488, Halifax, Nova Scotia	(902) 424-4425
New Brunswick	Radiation Protection Officer, Department of Health, Fredericton, N. B.	(506) 453-2067
Quebec	Division of Industrial Hygiene, Ministry of Municipal Affairs and Environment, 9310 St. Laurent Boulevard, Montreal, P. Q.	(514) 873-3454
Ontario	Senior Consultant, Health Physics, Community Health Standards Division, Ontario Ministry of Health, 15 Overlea Boulevard, Toronto, Ontario	(416) 965-8178
Manitoba	Co-Ordinator, Radiation Protection, Department of Mines, Research and Environmental Management, Box 7, 139 Tuxedo Avenue, Winnipeg, Manitoba	(204) 489-4511

REGIONS	OFFICE ADDRESS	TELEPHONE NO.
Manitoba	Radiation Protection Section, Physics Department, Manitoba Cancer Treatment and Research Foundation, 700 Bannatyne Avenue, Winnipeg 3, Manitoba	(204) 786-4731
Saskatchewan	Occupational Health Division, Department of Public Health, Provincial Health Building, Regina, Saskatchewan	(306) 527-8543
Alberta	Industrial Health Services Division, Alberta Health and Social Development, 10523-100 Avenue, Edmonton, Alberta	(403) 429-1491
British Columbia	Occupational Health Division, Department of Health Services and Hospital Insurance, 828 West Tenth Avenue, Vancouver 9, B. C.	(604) 874-2331

HEALTH PHYSICS
WALTER REED ARMY MEDICAL CENTER
Washington, D.C. 20012

HSWP-QHP
*SOP Number 1-6

26 March 1982

LEAK TESTING AND INVENTORY OF SEALED SOURCES

1. PURPOSE. The purpose of this SOP is to provide continuity in the standard leak testing procedures for sealed sources containing alpha, beta and/or gamma emitting radionuclides possessed, used and stored at WRAMC and tenant activities.

2. GENERAL.

a. Despite the fact that many precautions are taken to prevent leakage, the radioactive materials do occasionally leak from the capsule. Radioactive material which leaks from a source is a hazard in that it may become airborne or transported in some other way to become inhaled or ingested by personnel. The purpose of leak-testing sealed sources is to detect the leakage of the radionuclide before it becomes a hazard, and to comply with applicable regulations.

b. All sources at WRAMC will be leak-tested by the Health Physics Office Operations Branch.

c. Where a conflict of regulations (to include applicable USNRC Licenses and DA Authorizations) exists, the more restrictive regulation will be followed.

d. Sealed Source means any radioactive material that is inclosed in, or is to be used in, a container in a manner intended to prevent leakage of the radioactive material or any of its daughter products.

e. Leak Test Requirements:

(1) Each sealed source acquired by WRAMC and containing radioactive material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for contamination and/or leakage prior to use. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, the sealed source shall not be put into use until tested.

(2) Any licensed sealed source is exempt from such leak tests when the source contains 100 microcuries or less of beta and/or gamma emitting material or 10 microcuries or less of alpha emitting material.

(3) Except for alpha sources, the periodic leak test requirement specified below does not apply to sealed sources that are stored and not being used. The sources excepted from this test shall be tested for leakage prior to any use or transfer to another person unless they have been leak tested within six months prior to the date of use or transfer.

* This SOP supersedes HP SOP 1-6, dated 16 July 1980

SOP REVIEWED - NO CHANGES NEEDED - 28 JULY 1983

SOP REVIEWED - NO CHANGES NEEDED - 15 FEBRUARY 1985

(4) Each sealed source containing by-product material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for leakage and/or contamination at intervals not to exceed six months except that each source designed for the purpose of emitting alpha particles shall be tested at intervals not to exceed three months.

(5) The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is permanently or semipermanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained by the Health Physics Office.

f. If there is reason to suspect that a sealed source might have been damaged, it will be tested for leakage before further use.

g. All sealed sources found to be leaking and/or contaminated will be immediately withdrawn from use by Health Physics. The Health Physics Officer will determine whether or not the source is leaking. If it is leaking, he will direct that it be resealed or disposed of in accordance with existing regulations.

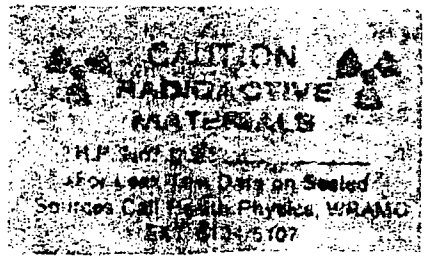
h. Inventory Requirements:

(1) Each sealed source at WRAMC containing quantities of radioactive material in excess of 0.1 microcuries of radionuclide requiring a DA Authorization, or quantities of by-product material in excess of the quantities listed in 10 CFR 30.71, Schedule B, shall be inventoried quarterly as required by 10 CFR 35.14.

(2) The leak testing procedure specified in paragraph 2e of this SOP shall constitute the required inventory for sources that must be leak tested.

(3) Each sealed source at WRAMC will be assigned a Health Physics Control Number by the Radioactive Materials Control Branch.

(4) Each sealed source or its container will be labeled as shown below with the Health Physics Control Number for that source:



3. SAFETY.

a. Appropriate safety measures will be observed while performing leak tests to minimize personnel exposures. Such measures will maximize the use of time, distance and shielding.

b. High intensity sources such as brachytherapy sources will not be touched They will be handled with remote handling devices or longhandled forceps.

c. Appropriate personnel monitoring devices such as whole-body film badges, wrist film badges and self-reading dosimeters will be worn while performing leak tests.

4. LEAK TESTING METHODS.

a. In general, alpha, beta and gamma sealed sources are leak tested by taking a one (1) inch diameter filter paper disc and obtaining a dry or wet wipe of accessible areas of the source or source holder in which the source is permanently mounted. When taking wet wipes the solution used should not be harmful to the source capsule or holder. All exposed surfaces of the source or holder will be wiped. Paper wipes will be placed in paper envelopes or plastic bags and sent for Laboratory analysis. Care will be taken to avoid cross-contamination.

b. Radium Sources.

(1) Brachytherapy sources (Charcoal Absorption Test) - Approximately 1/2 gram of activated charcoal is placed in a capped/stoppered glass tube. A wad of cotton is placed over the charcoal to separate charcoal and source. The source will remain in the sealed tube for at least 24 hours. After 24 hours, uncap the tube, remove the source, immediately reseal the tube and send sample to Laboratory for analysis. A blank charcoal control sample will be sent along with each sample to distinguish environmental Radon from that produced by the source.

(2) Other radium sources - Sources too large to be tested by the method outlined in b(1), above, will be tested by using a sealable plastic bag in place of the glass tube. All other procedures will be the same as b(1).

c. Gamma Irradiators (AECL Gammacells) - Dry paper wipes will be obtained from the following locations if they are accessible:

(1) Upper external ram.

(2) Inside the irradiator chamber.

(3) Lower external ram.

(4) Floor beneath the ram.

Leak testing will be performed with the source in the unexposed position.

5. SAMPLE PROCESSING.

a. All samples will be forwarded to the Laboratory for quantitative analysis. Samples will be identified by the Health Physics Control Number of the source tested.

b. Data furnished for samples taken by the Charcoal Adsorption Test will include the time when the source was removed from the glass tube.

c. Samples will be analyzed by the Laboratory using appropriate methods and results will be returned to requestor.

6. EVALUATION.

a. Radium Sources - If the leak test reveals the presence of 0.001 microcuries or more of removable contamination, it shall be immediately withdrawn from use and disposed of in accordance with this SOP.

b. Other Sources - If the leak test reveals the presence of 0.005 microcuries or more of removable contamination, it shall be immediately withdrawn from use and disposed of in accordance with this SOP.

7. DISPOSAL OF LEAKING SOURCES.

All sources found to be leaking greater than the values specified in para 6, above, will be handled in accordance with 10CFR 35.14 and 10 CFR 20, and will be immediately withdrawn from use, decontaminated and repaired or disposed of in accordance with applicable Federal, Army and State regulations.

8. INVENTORY AND LEAK TEST RECORDS FOR SEALED SOURCES.

a. A Record of Sealed Source Inventory and Leak Testing for each sealed source will be maintained by the Radioactive Materials Control Branch. The Record of Sealed Source Inventory and Leak Testing will contain the following information:

(1) Specific items of equipment or radioisotope

(2) Serial number

(3) Health Physics control number

(4) Location of items

(5) Radiation levels

(6) Radioactivity

(7) NRC or DA authorization numbers

(8) Receipts, transfers, and local disposals

(9) Date of inventory and name of person making the inventory

(10) WRAMC Radioactive Material Authorization number

b. The Record of Sealed Source Inventory and Leak Testing will also serve as a record of leak testing. Consecutive entries will be made for each test and include the date, activity detected in microcuries, and initials of person performing test.

9. REFERENCES.

a. Title 10, Code of Federal Regulations, Chapter 1, US Nuclear Regulatory Commission Rules and Regulations.

b. AR 40-37, Radioisotope License Program (Human-Use), 7 January 1977.

c. AR 385-11, Safety - Ionizing Radiation Protection, 1 May 1980.

d. NCRP Reports 28, 30, 33, 34 and 40.

e. NBS Handbook 114.

William E. Woodward

WILLIAM E. WOODWARD
LTC, MSC
Health Physics Officer

Element (atomic number)	Isotope	Col. I Gas concentration μCi/ml [1]	Col. II Liquid and solid concentration μCi/ml [2]
Yttrium (39)	Y 90		2×10^{-4}
	Y 91m		3×10^{-3}
	Y 91		3×10^{-4}
	Y 92		6×10^{-4}
	Y 93		3×10^{-4}
Zinc (30)	Zn 65		1×10^{-3}
	Zn 69m		7×10^{-4}
	Zn 69		2×10^{-2}
Zirconium (40)	Zr 95		6×10^{-4}
	Zr 97		2×10^{-4}
Beta and/or gamma emitting byproduct material not listed above with half-life less than 3 years		1×10^{-10}	1×10^{-7}

[1] Values are given only for those materials normally used as gases.
[2] μCi/gm for solids.

NOTE 1: Many radioisotopes disintegrate into isotopes which are also radioactive. In expressing the concentrations in Schedule A, the activity stated is that of the parent isotope and takes into account the daughters.

NOTE 2: For purposes of § 30.14 where there is involved a combination of isotopes, the limit for the combination should be derived as follows:

Determine for each isotope in the product the ratio between the concentration present in the product and the exempt concentration established in Schedule A for the specific isotope when not in combination. The sum of such ratios may not exceed "1" (i.e., unity).

Example:

$$\frac{\text{Concentration of Isotope A in Product}}{\text{Exempt concentration of Isotope A}} + \frac{\text{Concentration of Isotope B in Product}}{\text{Exempt concentration of Isotope B}} \leq 1$$

[30 FR 8185, June 26, 1965, as amended at 35 FR 3982, Mar. 3, 1970; 38 FR 29314, Oct. 24, 1973]

§ 30.71 Schedule B.

Byproduct material	Microcuries
Antimony 122 (Sb 122)	100
Antimony 124 (Sb 124)	10
Antimony 125 (Sb 125)	10
Arsenic 73 (As 73)	100
Arsenic 74 (As 74)	10
Arsenic 76 (As 76)	10
Arsenic 77 (As 77)	100
Barium 131 (Ba 131)	10
Barium 133 (Ba 133)	10
Barium 140 (Ba 140)	10
Bismuth 210 (Bi 210)	1
Bromine 82 (Br 82)	10
Cadmium 109 (Cd 109)	10
Cadmium 115m (Cd 115m)	10
Cadmium 115 (Cd 115)	100
Calcium 45 (Ca 45)	10
Calcium 47 (Ca 47)	10
Carbon 14 (C 14)	100
Cerium 141 (Ce 141)	100
Cerium 143 (Ce 143)	100
Cerium 144 (Ce 144)	1
Cesium 131 (Cs 131)	1,000
Cesium 134m (Cs 134m)	100
Cesium 134 (Cs 134)	1
Cesium 135 (Cs 135)	10
Cesium 136 (Cs 136)	10
Cesium 137 (Cs 137)	10
Chlorine 36 (Cl 36)	10
Chlorine 38 (Cl 38)	10
Chromium 51 (Cr 51)	1,000
Cobalt 58m (Co 58m)	10
Cobalt 58 (Co 58)	10
Cobalt 60 (Co 60)	1
Copper 64 (Cu 64)	100
Dysprosium 165 (Dy 165)	10
Dysprosium 166 (Dy 166)	100
Erbium 169 (Er 169)	100
Erbium 171 (Er 171)	100
Europium 152 9.2 h (Eu 152 9.2 h)	100
Europium 152 13 yr (Eu 152 13 yr)	1
Europium 154 (Eu 154)	1
Europium 155 (Eu 155)	10
Fluorine 18 (F 18)	1,000
Gadolinium 153 (Gd 153)	10
Gadolinium 159 (Gd 159)	100
Gallium 72 (Ga 72)	10
Germanium 71 (Ge 71)	100
Gold 198 (Au 198)	100
Gold 199 (Au 199)	100
Hafnium 181 (Hf 181)	10
Holmium 166 (Ho 166)	100
Hydrogen 3 (H 3)	1,000
Indium 113m (In 113m)	100
Indium 114m (In 114m)	10
Indium 115m (In 115m)	100
Indium 115 (In 115)	10
Iodine 125 (I 125)	1
Iodine 126 (I 126)	1
Iodine 129 (I 129)	0.1
Iodine 131 (I 131)	1
Iodine 132 (I 132)	10
Iodine 133 (I 133)	1
Iodine 134 (I 134)	10
Iodine 135 (I 135)	10
Iridium 192 (Ir 192)	10

Byproduct material	Microcuries
Iridium 194 (Ir 194)	100
Iron 55 (Fe 55)	100
Iron 59 (Fe 59)	10
Krypton 85 (Kr 85)	100
Krypton 87 (Kr 87)	10
Lanthanum 140 (La 140)	10
Lutetium 177 (Lu 177)	100
Manganese 52 (Mn 52)	10
Manganese 54 (Mn 54)	10
Manganese 56 (Mn 56)	10
Mercury 197m (Hg 197m)	100
Mercury 197 (Hg 197)	100
Mercury 203 (Hg 203)	10
Molybdenum 99 (Mo 99)	100
Neodymium 147 (Nd 147)	100
Neodymium 149 (Nd 149)	100
Nickel 59 (Ni 59)	100
Nickel 63 (Ni 63)	10
Nickel 65 (Ni 65)	100
Niobium 93m (Nb 93m)	10
Niobium 95 (Nb 95)	10
Niobium 97 (Nb 97)	10
Osmium 185 (Os 185)	10
Osmium 191m (Os 191m)	100
Osmium 191 (Os 191)	100
Osmium 193 (Os 193)	100
Palladium 103 (Pd 103)	100
Palladium 109 (Pd 109)	100
Phosphorus 32 (P 32)	10
Platinum 191 (Pt 191)	100
Platinum 193m (Pt 193m)	100
Platinum 193 (Pt 193)	100
Platinum 197m (Pt 197m)	100
Platinum 197 (Pt 197)	100
Polonium 210 (Po 210)	0.1
Potassium 42 (K 42)	10
Praseodymium 142 (Pr 142)	100
Praseodymium 143 (Pr 143)	100
Promethium 147 (Pm 147)	10
Promethium 149 (Pm 149)	10
Rhenium 186 (Re 186)	100
Rhenium 188 (Re 188)	100
Rhodium 103m (Rh 103m)	100
Rhodium 105 (Rh 105)	100
Rubidium 86 (Rb 86)	10
Rubidium 87 (Rb 87)	10
Ruthenium 97 (Ru 97)	100
Ruthenium 103 (Ru 103)	10
Ruthenium 105 (Ru 105)	10
Ruthenium 106 (Ru 106)	1
Samarium 151 (Sm 151)	10
Samarium 153 (Sm 153)	100
Scandium 46 (Sc 46)	10
Scandium 47 (Sc 47)	100
Scandium 48 (Sc 48)	10
Selenium 75 (Se 75)	10
Silicon 31 (Si 31)	100
Silver 105 (Ag 105)	10
Silver 110m (Ag 110m)	1
Silver 111 (Ag 111)	100
Sodium 24 (Na 24)	10
Strontium 85 (Sr 85)	10
Strontium 89 (Sr 89)	1
Strontium 90 (Sr 90)	0.1
Strontium 91 (Sr 91)	10
Strontium 92 (Sr 92)	10
Sulphur 35 (S 35)	100
Tantalum 182 (Ta 182)	10
Technetium 96 (Tc 96)	10
Technetium 97m (Tc 97m)	100
Technetium 97 (Tc 97)	100
Technetium 99m (Tc 99m)	100
Technetium 99 (Tc 99)	10

Byproduct material	Microcuries
Tellurium 125m (Te 125m)	10
Tellurium 127m (Te 127m)	10
Tellurium 127 (Te 127)	100
Tellurium 129m (Te 129m)	10
Tellurium 129 (Te 129)	100
Tellurium 131m (Te 131m)	10
Tellurium 132 (Te 132)	10
Terbium 160 (Tb 160)	10
Thallium 200 (Tl 200)	100
Thallium 201 (Tl 201)	100
Thallium 202 (Tl 202)	100
Thallium 204 (Tl 204)	10
Thulium 170 (Tm 170)	10
Thulium 171 (Tm 171)	10
Tin 113 (Sn 113)	10
Tin 125 (Sn 125)	10
Tungsten 181 (W 181)	10
Tungsten 185 (W 185)	10
Tungsten 187 (W 187)	100
Vanadium 48 (V 48)	10
Xenon 131m (Xe 131m)	1,000
Xenon 133 (Xe 133)	100
Xenon 135 (Xe 135)	100
Ytterbium 175 (Yb 175)	100
Yttrium 90 (Y 90)	10
Yttrium 91 (Y 91)	10
Yttrium 92 (Y 92)	100
Yttrium 93 (Y 93)	100
Zinc 65 (Zn 65)	10
Zinc 69m (Zn 69m)	100
Zinc 69 (Zn 69)	1,000
Zirconium 93 (Zr 93)	10
Zirconium 95 (Zr 95)	10
Zirconium 97 (Zr 97)	10
Any byproduct material not listed above other than alpha emitting byproduct material	0.1

NOTE: The reporting and record keeping requirements contained in this part have been approved by the General Accounting Office under B-180225 (R0079), (R0089), and (R0173).

(Sec. 201, Pub. L. 93-438, 88 Stat. 1242 (42 U.S.C. 5841))

[35 FR 6427, Apr. 22, 1970, as amended at 36 FR 16898, Aug. 26, 1971; 42 FR 25721, May 19, 1977]

CURRICULUM VITAE

for

WILLIAM E. WOODWARD, M.S.A., M.S.P.H.

Date & Place of Birth: [redacted]

Home Address: [redacted]

Home Telephone Number: [redacted]

Office Address: Health Physics Office
Walter Reed Army Medical Center
Washington, DC 20307

Office Telephone Number: (301) 427-5161

Degrees:

MSA - Governmental Administration [redacted]
George Washington University
Washington, D.C.

MSPH - Radiological Health [redacted]
University of North Carolina
Chapel Hill, NC

BS - Biology [redacted]
Virginia Military Institute
Lexington, VA

Other Education and Training:

1980	Medical Effects of Nuclear Weapons Armed Forces Radiobiology Research Institute Bethesda, MD
1973	NBC Defense Officer's Course NATO School Oberammergau, Germany
1971	Operations Research/Systems Analysis Executive Course US Army Management School Fort Belvoir, VA
1970	Introduction to Computer Technology Department of Defense Computer Institute Washington, DC

Incl 5 to Supl 2, Form NRC 313(I), Items 16 & 17

Ex 2

WOODWARD, William E. (Continuation of Curriculum Vitae)

1969	Contract Administration George Washington University Washington, DC
1969	CBR Weapons Orientation Course Dugway Proving Ground, Utah
1968 & 1962	Nuclear Weapons Orientation Advanced Course Interservice Nuclear Weapons School Sandia Base, New Mexico
1968	Nuclear Hazards Training Course Interservice Nuclear Weapons School Sandia Base, New Mexico
1967	AMEDD Officer Advanced Course Fort Sam Houston, TX
1962	Medico-Military Applications for Nuclear Medical Officers Part I — National Naval Medical Center Bethesda, MD Part II — Walter Reed Army Institute of Research Washington, DC
1957	AMEDD Officer Basic Course Fort Sam Houston, TX

Chronological Experience

Jun 1981 - Present	Chief, Health Physics Office Walter Reed Army Medical Center Washington, DC 20307
Sep 1978 - Jun 1981	Biomedical Radiation Effects Staff Officer Weapons Effects Division US Army Nuclear and Chemical Agency Fort Belvoir, VA
Sep 1975 - Sep 1978	Director of Programs US Army Medical Research and Development Command Fort Detrick, MD
Jun 1972 - Sep 1975	Deputy Commander US Army Radiological Hygiene Agency, Europe Landstuhl, Germany
Jan 1968 - Jun 1972	Chief, Radiation Research Branch US Army Medical Research and Development Command Washington, DC

WOODWARD, William E. (continuation of Curriculum Vitae)

Aug 1965 - Jan 1968	Biology Department Staff Division of Medicinal Chemistry Walter Reed Army Institute of Research Washington, DC
Nov 1962 - Aug 1965	Chief, Radioisotope Laboratory US Army Tropical Research Medical Laboratory San Juan, Puerto Rico

Experience Summary:

Seventeen (17) years of applied Health Physics, Biomedical Radiation Effects Research, and Radiological Emergency Medical Response Planning. Currently, Director of the health physics program for Walter Reed Army Medical Center. The Center's program provides comprehensive health physics support to a 1280-bed hospital, the Walter Reed Army Institute of Research, the Armed Forces Institute of Pathology, the US Army Medical Research Institute for Infectious Diseases and certain other activities in the Washington area. The program monitors three (3) Nuclear Regulatory Commission By-Product Material Licenses and a Department of Army Authorization for naturally occurring/accelerator produced radionuclides. The program encompasses approximately 150 laboratories using radioactive materials, 160 X-ray units, 25 high intensity light sources, and 450 individuals on personnel dosimetry monitoring. Also responsible for the training, equipping and direction of the only Army Radiological Advisory Medical Team, a nuclear accident/incident control team. Previous health physics experience encompassed evaluation and administration of nuclear medicine pharmacy procedures, research and development of methods for providing protection against the effects of nuclear radiation on the battlefield, and establishment of policies and procedures for the organization, training, equipping, and testing of the US Army's Radiological Emergency Medical Response Teams. These assignments involved lecturing to staff, dosimetry and measurement, equipment specification, emergency planning and analysis of personnel radiation protection measures.

BIBLIOGRAPHY

C.J.D. Zarafonetis, H.L. Ley, Sr., D.M. Kerr, R.L. Wagner, Jr., and W. E. Woodward: "Nuclear Protection for the Soldier," Final Report of the AD HOC Committee of the Army Scientific Advisory Panel, April 1977.

HSWP-QHP

JUL 1 8 1980

SUBJECT: Renewal of US Nuclear Regulatory Commission License No. 08-01738-03

THRU: TSG HQDA (~~DASG-PSP-E~~)
Washington, DC 20310

18 Jul 80
ROBERT T. WANGEMANN
Colonel, MSC
Radiological Hygiene Consultant

TO: Director
Division of Fuel Cycle and Material Safety
Office of Nuclear Material Safety and Safeguards
US Nuclear Regulatory Commission
Washington, DC 20555

Enclosed are two copies of application for renewal of USNRC License No. 08-01738-03 for Walter Reed Army Medical Center.

FOR THE COMMANDER:

Patrick J Mumma
PATRICK J. MUMMA
MAJ, MSC
Adjutant General

1 Incl
as (dupe)

CF: CDR, HSC, ATTN: HSPA-P
CDR, USAEHA, ATTN: HSE-RH

8008200413

0461 5

JUL 6 1980

Department of the Army
Walter Reed Army Medical Center
ATTN: Bernhard T. Miteemeyer, MD
Major General, MC
Commanding
Washington, D.C. 20012

LICENSE NO. 08-01738-03

CONTROL NO. 04615

DOCKET NO. 030-06895

SUBJECT: LICENSE RENEWAL APPLICATION

Gentlemen:

This is to acknowledge receipt of your application for renewal of the material(s) license identified above. Your application is deemed timely filed, and accordingly, the license will not expire until final action has been taken by this office.

Any correspondence regarding the renewal application should reference the control number specified and your license number.

Sincerely,

Leah Tremper
Material Licensing Branch
Division of Fuel Cycle and
Material Safety

FORM NRC-313 I (1-79)
10 CFR 30

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR BYPRODUCT MATERIAL LICENSE
INDUSTRIAL

See attached instructions for details.

Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.

1. APPLICATION FOR: *(Check and/or complete as appropriate)*

	a. NEW LICENSE
	b. AMENDMENT TO: LICENSE NUMBER
X	c. RENEWAL OF: LICENSE NUMBER 08-01738-03

2. APPLICANT'S NAME *(Institution, firm, person, etc.)*
Walter Reed Army Medical Center
Washington, DC 20012

TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
(202) 576-1100

3. NAME OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION
CPT Dennis A. Stevenson
Health Physics Officer, WRAMC

TELEPHONE NUMBER: AREA CODE – NUMBER EXTENSION
(301) 427-5104

4. APPLICANT'S MAILING ADDRESS *(Include Zip Code)*
Commander
Walter Reed Army Medical Center
ATTN: HSWP-QHP
Washington, DC 20012

5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED *(Include Zip Code)*
Walter Reed Army Institute of Research, Washington, DC 20012 & US Army Medical Research Institute for Infectious Diseases, Ft Detrick, Frederick, MD 21701

(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)

6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL
(See Items 16 and 17 for required training and experience of each individual named below)

	FULL NAME	TITLE
a.	Individuals approved by the Radiation Control Committee, Walter Reed Army Medical Center	
b.		
c.		

7. RADIATION PROTECTION OFFICER
CPT Dennis A. Stevenson - Ref: AR 40-14 & AR 40-37, the Health Physics Officer will be appointed by the Commanding General, WRAMC.

Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.

8. LICENSED MATERIAL

LINE NO.	A ELEMENT AND MASS NUMBER	B CHEMICAL AND/OR PHYSICAL FORM	C NAME OF MANUFACTURER AND MODEL NUMBER *(If Sealed Source)*	D MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME
(1)	Cobalt-60	Sealed Source	AECL, Model C-166, C-167 or C-198	Max. total Ci: 16,000 Max. Ci/source:16,000
(2)	Cesium-137	Sealed Source	AECL, Model C-161-Type 8	Max. Total Ci: 4,200 Max. Ci/source: 2,100
(3)	Cobalt-60	Sealed Source	AECL, Model C-198	Max. total Ci: 26,400 Max.Ci/source: 26,400
(4)	Cesium-137	Sealed Source	AECL, Model C-161-Type 8	Max. total Ci: 4,200 Max. Ci/source: 2,100

	E DESCRIBE USE OF LICENSED MATERIAL
(1)	To be used in AECL Gammacell 220 irradiator located at WRAIR, Washington, DC, for medical research and development and radiation dosimetry.
(2)	To be used in AECL Gammacell 40 Irradiator located at WRAIR, Washington, DC for small animal irradiation, medical research, development and radiation dosimetry.
(3)	To be used in AECL Gammacell 220 Irradiator located at USAMRIID, Ft. Detrick, Frederick, MD for medical research and development & radiation dosimetry.
(4)	To be used in AECL Gammacell 40 Irradiator located at USAMRIID, Ft. Detrick, Frederick, MD for medical research and development and radiation dosimetry.

04615 0461

9. STORAGE OF SEALED SOURCES

LINE NO.	CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED. A.	NAME OF MANUFACTURER B.	MODEL NUMBER C.
(1)	AECL Gammacell 220 Irradiator	Atomic Energy of Canada Limited	Gammacell 220
(2)	AECL Gammacell 40 Irradiator	Atomic Energy of Canada Limited	Gammacell 40
(3)	AECL Gammacell 220 Irradiator	Atomic Energy of Canada Limited	Gammacell 220
(4)	AECL Gammacell 40 Irradiator	Atomic Energy of Canada Limited	Gammacell 40

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	TYPE OF INSTRUMENT A	MANUFACTURER'S NAME B	MODEL NUMBER C	NUMBER AVAILABLE D	RADIATION DETECTED (alpha, beta, gamma, neutron) E	SENSITIVITY RANGE (milliroentgens/hour or counts/minute) F
(1)	REFERENCE: Application for renewal of NRC Materials License - Medical, No. 08-01738-02, 18 July 1979, Tab 9.					
(2)						
(3)						
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☒ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

REFERENCE: Application for renewal of NRC Material License - Medical, No. 08-01738-02, 18 July 1979, Tab 10.

☐ b. CALIBRATED BY APPLICANT

Attach a separate sheet describing method, frequency and standards used for calibrating instruments.

12. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate.) A	SUPPLIER (Service Company) B	EXCHANGE FREQUENCY C
☐ (1) FILM BADGE ☐ (2) THERMOLUMINESCENCE DOSIMETER (TLD) ☐ (3) OTHER (Specify): _____	REFERENCE: Application for renewal of NRC Materials License-Medical, No. 08-1738-02, 18 July 1979, page 3 of Form NRC-313M.	☐ MONTHLY ☐ QUARTERLY ☐ OTHER (Specify): _____

13. FACILITIES AND EQUIPMENT (Check were appropriate and attach annotated sketch(es) and description(s).

☒ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS (Include filtration, if any), ETC.

☒ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING (fixed and/or temporary), ETC.

☐ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.

☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC. SEE SUPPLEMENT NO. 1.

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

Sealed sources specified in this application will be returned to the manufacturer for disposal.

04615

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

15. RADIATION PROTECTION PROGRAM. Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures *(if needed)*, day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.

16. FORMAL TRAINING IN RADIATION SAFETY. Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.

    a. Principles and practices of radiation protection.

    b. Radioactivity measurement standardization and monitoring techniques and instruments.

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

    d. Biological effects of radiation.

17. EXPERIENCE. Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

SEE SUPPLEMENT NO. 2.

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, 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.

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.

a. LICENSE FEE REQUIRED *(See Section 170.31, 10 CFR 170)*	b. CERTIFYING OFFICIAL *(Signature)* Bernhard T. Mittemeyer
	c. NAME *(Type or print)* BERNHARD T. MITTEMEYER, MD
(1) LICENSE FEE CATEGORY:	d. TITLE Major General, MC Commanding
(2) LICENSE FEE ENCLOSED: $	e. DATE 18/7/80

FORM NRC-313 I (1-79)

S U P P L E M E N T N O. 1

Item 13, Form NRC-313(I), Facilities and Equipment Renewal Application for NRC NRC License 08-01738-03

1. Item 13a, Facilities:

a. AECL Gammacells listed on lines number 1 and 2, Item 8 of this application are located on the ground level of Building 40, Room B099, Walter Reed Army Institute of Research (WRAIR), Walter Reed Army Medical Center, Washington, DC. The Gammacell 220 is located in the northeast corner of Room B099. The Gammacell 40 is located in the irradiation suite of Room B099. Since the irradiation suite was designed for X-ray use, it is constructed with lead-lined walls, door, and a thick concrete ceiling. The only entrance to Room B099 is a door located in the southwest corner. A diagram of Room B099 is attached as Inclosure 1 to this supplement.

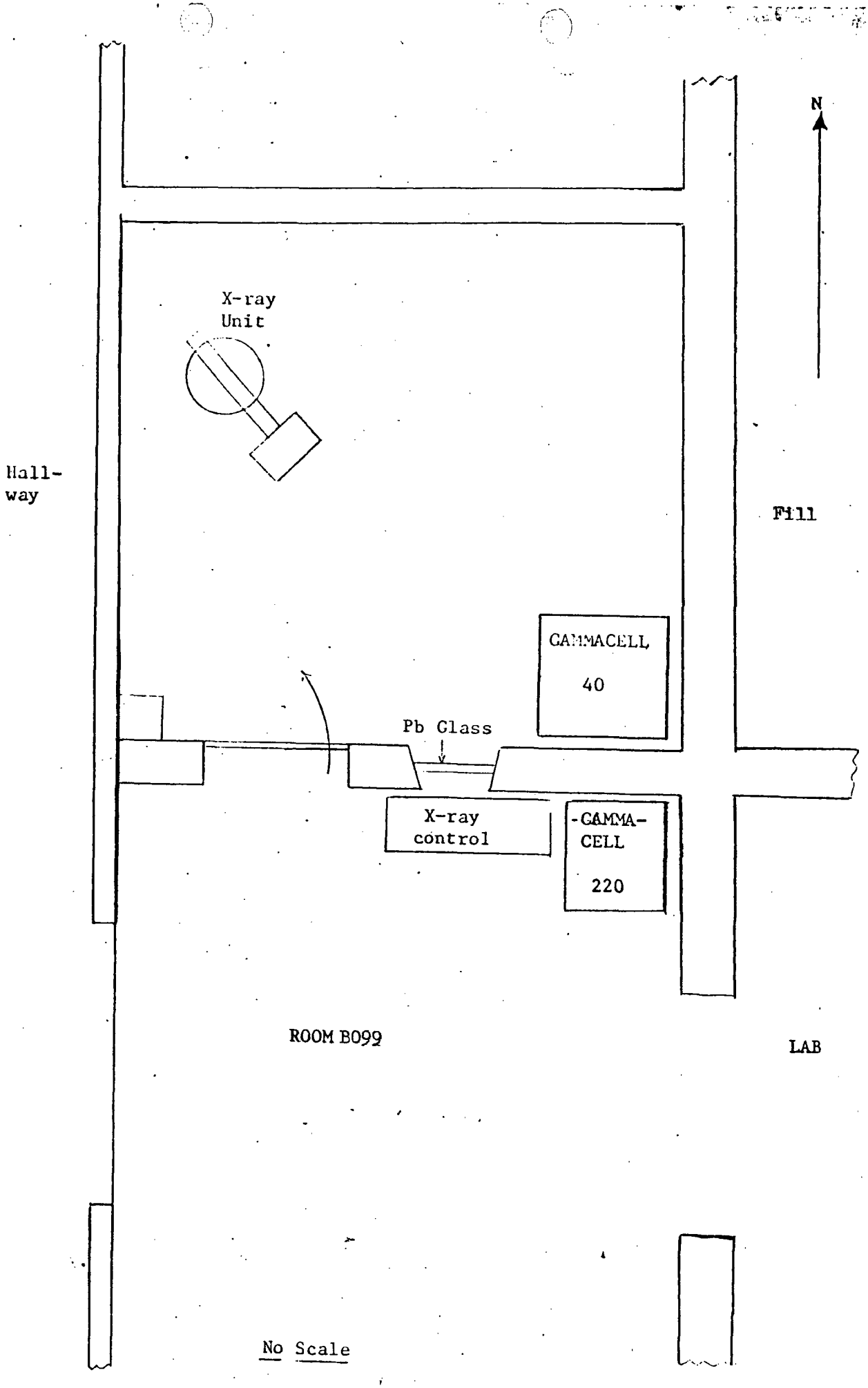
b. AECL Gammacells listed on lines number 3 and 4, Item 8 of this application are located on the ground level of Building 1425, Room AA413, USAMRIID, Fort Detrick, MD. Since Room AA413 was designed as an irradiation suite, the walls and ceiling are constructed of high density concrete of 12" and 16" thickness respectively. The room is bordered on two sides by biological hot suites and on two sides by infrequently used hallways. The overhead area is a pipe and ventilation crawl space which would be occupied only in case of repairs. A diagram of Room AA413 is attached as Inclosure 2 to this supplement.

2. Item 13b, Storage Facilities, Containers and Special Shielding:

AECL Gammacells listed in Item 8 of this application will be permanently used and stored in the locations specified above. Since the sealed sources will not be removed from their respective Gammacell units, no additional containment or shielding is required.

3. Item 13c and d, Remote Handling Tools and Respiratory Protective Equipment:

Since the sealed sources are an integral part of the Gammacell unit, no remote handling tools, equipment or respiratory protective equipment is required for operations involving use of the Gammacell units. Equipment that could be utilized to respond to an unforeseen emergency is specified in the application for renewal of NRC Material License - Medical, No. 08-01738-02, 18 July 1979, Tab 11.


N
X-ray
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ROOM B099
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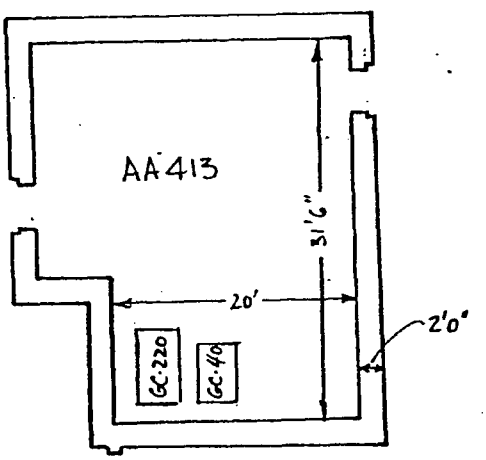
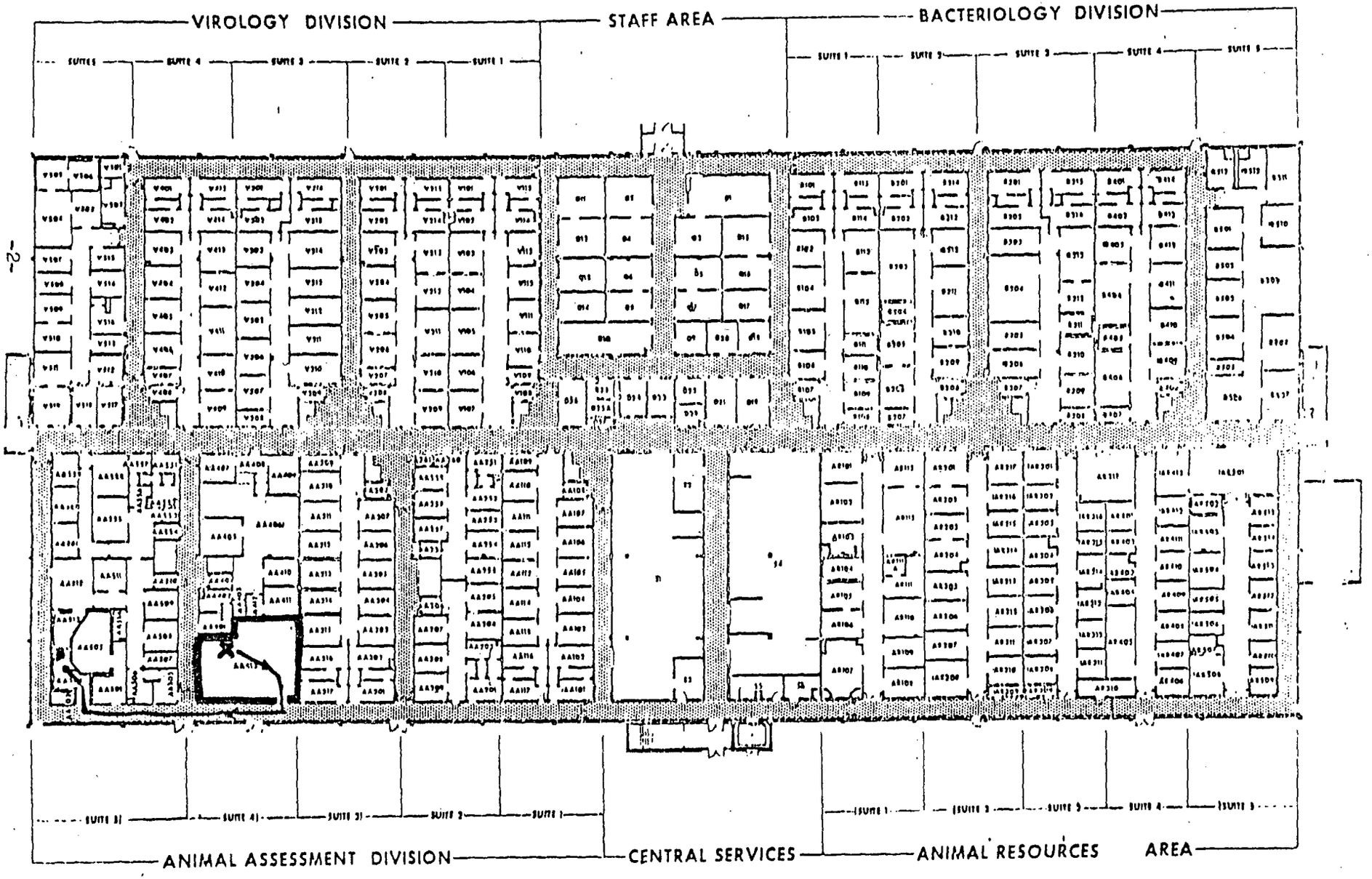


Incl 2 to Supl 1 of Item 13 Form NRC 313(I)


VIROLOGY DIVISION
STAFF AREA
BACTERIOLOGY DIVISION
SUITE 5
SUITE 4
SUITE 3
SUITE 2
SUITE 1
SUITE 1
SUITE 2
SUITE 3
SUITE 4
SUITE 5
SUITE 5
SUITE 4
SUITE 3
SUITE 2
SUITE 1
SUITE 1
SUITE 2
SUITE 3
SUITE 4
SUITE 5
ANIMAL ASSESSMENT DIVISION
CENTRAL SERVICES
ANIMAL RESOURCES
AREA

FLOOR PLAN

S U P P L E M E N T N O. 2

Items 15, 16 and 17, Form NRC-313(I), Renewal Application for NRC License No. 08-01738-03

1. Item 15, Radiation Protection Program:

a. Radiation Protection Officer's duties and responsibilities are enumerated in AR 40-37, "Medical Services - Licensing and Control of Radioactive Materials for Medical Purposes," Appendix B, 7 January 1977. See Inclosure 1 to this supplement.

b. Radiation Control Committee's duties and responsibilities are enumerated in the application for renewal of NRC Materials License - Medical, No. 08-01738-02, 18 July 1979, Tab 7.

c. The procedure for obtaining authorization to use radioactive material under Walter Reed Army Medical Center's Nuclear Regulatory Commission Licenses is enumerated in the application for renewal of NRC Materials License - Medical, No. 08-01738-02, 18 July 1979, Tab 8.

d. Operating and safety procedures for AECL Gammacell 220 Irradiator and Gammacell 40 Irradiator are attached as Inclosures 2 and 3 respectively to this supplement.

(1) Any proposed modifications to a Gammacell unit, including all proposed deviations from established operational or administrative procedures shall be submitted to WRAMC Radiation Control Committee. This committee shall review such proposals and determine whether or not they are advantageous to the operation of a Gammacell unit. All proposals will be classified in one of the following categories.

(a) Major Safety Change: Any change which affects the degree of hazard associated with the operation of an AECL Gammacell unit.

(b) Minor Safety Change: Any change not classified as a major change which is directly associated with the safety of a Gammacell unit. Included in this category are changes in the principal administration and operational procedures, health physics procedures and mechanical or electrical system alterations to a Gammacell unit.

(c) Routine Change: Changes which have no bearing on the safety characteristics of a Gammacell unit.

(2) All major and minor safety changes require the approval of the WRAMC Radiation Control Committee prior to requesting approval of proposed changes, through appropriate channels, from the Nuclear Regulatory Commission.

e. Leak testing procedures shall be performed in accordance with the applicable sections of HSWP-QHP Standard Operating Procedure Number 1-6, "Leak Testing and Inventory of Sealed Sources," 16 July 1980 (Inclosure 4).

2. Item 16, Formal Training in Radiation Safety; and Item 17, Experience:

a. Individuals who will use or directly supervise use of licensed material specified in this application must be approved by the WRAMC Radiation Control Committee in accordance with the procedures delineated in the application for renewal of NRC Material License - Medical, No. 08-01738-02, 18 July 1979, Tabs 7 and 8.

b. A resume of the training experience for CPT Dennis A. Stevenson, Health Physics Officer, WRAMC, is attached as Inclosure 5 to this supplement.

ARMY REGULATION
NO. 40-37

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *7 January 1977*

MEDICAL SERVICES

LICENSING AND CONTROL OF RADIOACTIVE MATERIALS FOR MEDICAL PURPOSES

Effective 1 February 1977

This is a complete revision of AR 40-37 and reflects the current requirements of the Nuclear Regulatory Commission as published in Title 10, Code of Federal Regulations, for the use and control of radioactive materials for medical purposes worldwide. Supplementation of this regulation is prohibited, except upon approval of The Surgeon General [HQDA (DASG-HCH) WASH DC 20310]. This regulation does not apply to the USAR and NBG.

1. Purpose. The purpose of this regulation is to—

a. Prescribe policies and procedures for the use and control of radioactive materials for medical purposes.

b. Prescribe procedures for obtaining Nuclear Regulatory Commission (NCR) licenses and amendments.

c. Prescribe procedures for obtaining Department of the Army (DA) radioactive material authorizations and amendments for radioactive materials not controlled or licensed by the NRC.

d. Establish procedures for the reporting of radioactive materials used in medical programs.

2. Scope. This regulation—

a. Applies to all Army medical facilities producing, procuring, storing, possessing, shipping, transferring, using, and disposing of radioactive materials for medical purposes worldwide.

b. Does not negate or supersede any NRC or Food and Drug Administration (FDA) requirements pertaining to the control, safeguard, and use of radioactive materials for medical purposes.

*This regulation supersedes AR 40-37, 12 August 1963.

Sep 29 '80

Incl 1 to Supl 2 to Item 15, Form NRC 313(I)

APPENDIX B
RADIATION PROTECTION OFFICER

B–1. The RPO is an individual designated by the commander to provide consultation and advice on the degree of hazards associated with radiation and the effectiveness of the measures to control these hazards. In addition, he will supervise the radiation protection program (AR 40-14).

B–2. Organizationally, the RPO will be in a position wherein he can effectively advise the commander and the radiation workers on all matters pertaining to radiation protection.

B–3. Responsibilities of the RPO will include, but not be limited to:

a. Providing the commander, Radioisotope/Radiation Control Committee and radiation workers with advice and assistance on all matters pertaining to radiation protection. This includes instructing and training of workers (users) and visitors in the safe use of protective equipment and radiation producing devices (AR 40-5 and AR 40-14).

b. Providing guidance on types of protective clothing and equipment required and its proper use (AR 40-5).

c. Reviewing radiological operations to determine compliance with regulations and approved procedures.

d. Reviewing or preparing SOP for operations involving sources of ionizing radiation prior to approval by the Radioisotope/Radiation Control Committee (AR 40-5).

e. Reviewing and approving the procurement of all radioactive material and radiation producing devices.

f. Insuring that proper personnel monitoring devices are used and that necessary bioassays are performed and required records are maintained of the results (AR 40-5 and AR 40-14).

g. Insuring that radiation survey/detection instruments used in radiation protection are properly calibrated and are available to radiation workers (AR 40-5 and TB 43-180).

h. Insuring that all radiation shields, containers and handling equipment are maintained in satisfactory condition (AR 40-5).

i. Insuring the proper posting of any radiation warning signs (AR 385-30).

j. Maintaining a current inventory of radioactive materials and a registry of radiation producing devices.

k. Maintaining the required radiation protection records (AR 340-18-6).

l. Conducting a physical inventory of radioactive materials at least once every 3 months.

m. Performing radiation surveys and leak tests or insuring that such surveys and leak tests are performed. The accuracy of tests and surveys, if performed by others, remains the responsibility of the RPO (AR 40-5).

n. Evaluating the hazard potential and adequacy of protective measures for existing and proposed operations (AR 40-5).

o. Monitoring incidents wherein unusual levels of radiation or radioactive contamination are suspected (AR 40-5).

p. Insuring that all radioactive materials are properly used, stored, handled, shipped and disposed of in accordance with applicable directives (AR 40-5).

q. Formulating and implementing the radiation protection program.

r. Investigating radiation accidents/incidents and overexposures to determine the cause and taking steps to prevent recurrence (AR 40-5 and AR 40-14).

s. Terminating a project or procedure involving the use of radioactive material or radiation producing device which is found to be a threat to health or property.

B–4. The RPO will act as executive agent for all NRC licenses and DA radioactive material authorizations for the possession, use and storage of radioactive material.

B–5. The RPO should be a member of the following installation/activity committees if such committees have been established (the name of the committees may vary):

a. The Radioisotope/Radiation Control Committee (AR 40-14).

b. The reactor Safeguards Committee (AR 385-80).

c. The Safety and Health Committee (AR 385-10).

d. The Accelerator Facility Safety Committee.

e. The Human Use Committee, if radioactive material is used (AR 40-38).

f. The Clinical Investigation Committee, if radioactive material is used (AR 40-38).

g. The Radioactive Drug Research Committee.

HEALTH PHYSICS
WALTER REED ARMY MEDICAL CENTER
Washington, D.C. 20012

HSWP-QHP
SOP Number

OPERATING AND SAFETY PROCEDURES FOR AECL GAMMACELL 220 IRRADIATOR

1. GENERAL

a. The Gammacell 220 (GC-220) shall be used (operated) by, or under the direct supervision of individuals designated by the Walter Reed Army Medical Center (WRAMC) Radiation Control Committee, Deputy Commander, WRAMC, Chairman.

b. The authorized Principal User is directly responsible for the control and safe use of this irradiator and will designate individuals to operate the GC-220 as approved by the WRAMC Radiation Control Committee.

c. The GC-220 shall be used for medical research and development in radiation biology and radiation dosimetry.

2. DEFINITIONS

Because the precise meaning given to one or more critical terms frequently determines the interpretation of a statement, the following definitions are given for certain words and phrases as they are used in this document:

a. "Shall" - denotes that the ensuing recommendation is necessary or essential to meet the currently accepted standards of radiation protection.

b. "Should" (is recommended) - indicates advisory recommendations that are to be applied when practicable.

c. "Explosive" - explosives are either solid or liquid, either mixtures or single compounds, and act by explosive chemical reaction, liberating at high speed heat and gas, which causes tremendous pressure.

d. "Flammable" - materials capable of being easily ignited; preferred to "inflammable" because of possible ambiguity of the in prefix.

e. "Individual" and/or "Operator" - a person designated by the authorized Principal User as approved by the WRAMC Radiation Control Committee, to operate the AECL Gammacell 220 Irradiator.

f. "Emergency" - an unforeseen combination of circumstances (e.g., failure of an interlock or safety device, fire, ruptured or leaking source, etc.) that poses a threat to personnel or property by ionizing radiation.

3. RESPONSIBILITIES

a. The authorized Principal User:

(1) Ensuring that the GC-220 is operated only by individuals authorized to do so by the WRAMC Radiation Control Committee and in accordance with the conditions of WRAMC Radioactive Material Authorization.

(2) Instruction of individuals in safe operating procedures in accordance with instructions outlined herein. He shall promulgate rules for working safety, including any restrictions of the operating technique known to be necessary.

(3) Ensuring that these instructions and references contained in para 7 are available at the GC-220 unit at all times.

(4) Promptly reporting any source malfunction, accident, or other unplanned occurrence that could result in an unsafe condition or exposure to personnel to the WRAMC Health Physics Officer (301-427-5107).

(5) Assure that all personnel operating the unit are monitored by appropriate personnel monitoring devices.

(6) Assure that personnel operating the unit have been instructed in the hazards and nature of injuries resulting from overexposure to ionizing radiation [e.g., attendance at appropriate WRAMC personnel training programs (HSWP-QHP Memo #2)].

b. WRAMC Health Physics:

(1) Conducting routine radiation protection surveys and inspections.

(2) Providing technical assistance as required.

(3) Providing calibration and routine maintenance services for radiation detection and measuring instruments required in WRAMC Radioactive Material Authorization.

c. Individual Operators:

(1) Operating the unit in accordance with the operation and safety procedures delineated in this SOP.

(2) Recording all pertinent information in the operating log maintained by the authorized Principal User.

(3) Being familiar with the content of these instructions, requirements of the WRAMC authorization, and other regulations as may be prescribed by the authorized Principal User.

(4) Locking the GC-220 unit and the room upon completion of use.

(5) Ensuring that the keys to the unit and the room door are properly secured to prevent unauthorized use.

(6) Reporting all malfunctions, accidents, and any other unplanned occurrence that could result in an unsafe condition or exposure of personnel promptly to the authorized Principal User.

4. OPERATING PROCEDURES.

a. Insert key in keyswitch and turn clockwise 90°.

b. Raise the drawer by pressing the UP rocker switch.

c. To opern the collar doors, press and hold in the button on the top of the door interlock, grasp the right hand door handle, pull back the latch lever, release the button and pull the doors open.

d. Slide the sample chamber locking ring to the right, remove the door by lifting it up and outwards.

e. Place the sample in the chamber. The access tube in the drawer top accommodates accessory tubes and electrical leads, which should be fitted in accordance with the instructions provided in the Gammacell 220 Accessories Manual.

f. Replace the sample chamber door with a forward and downward motion. Move the locking ring to the left until it snaps into position. If difficulties are experienced, check that the door is correctly positioned in the port.

g. To close the collar doors, press and hold in the button on the top of the door interlock. Grasp the right hand door handle, pull back the latch lever, release the button and push the doors closed.

h. If automatic operation is desired set the irradiation time in the following manner:

(1) Push the timer reset knob, turn it clockwise 90°, and release; the white line on the knob should be horizontal.

(2) Open the hinged cover which protects the predetermining drums; turn the knurled wheels either direction until the desired number sequence appears in the windows.

(3) Rotate the selector switch to hours, minutes or seconds. Close the hinged cover and turn the timer reset knob counterclockwise; the white line on the knob should be vertical, press the reset knob to set the timer.

(4) Push the DOWN switch. The drawer will lower to the irradiating position, activate the timer, and remain there until the preset time interval has elapsed, when it will automatically raise.

i. If manual operation is desired rotate the selector switch to MANUAL and press the DOWN switch. The drawer will lower and remain there indefinitely until the UP switch is operated.

j. To remove the sample repeat steps b - d.

5. SAFETY FEATURES

There are a variety of safety features incorporated into the unit for the protection of the operator.

a. Three microswitches are mounted on the collar door to ensure that:

(1) The sample chamber door is properly located.

(2) The locking ring is in position.

(3) Both collar doors are closed.

b. A fourth microswitch is located on the top shilding plug to ensure that the plug is closed.

c. Unless all four microswitches are actuated the drive motor will not start.

d. The self-locking feature of the worm gear reducer acts as a brake to prevent the drawer moving down under its own weight.

e. A solenoid-operated ram prevents the sample drawer from moving down in the event of a drive system mechanical failure.

f. Drawer movement can be arrested by switching off the electrical supply key switch.

g. A solenoid-operated door interlock ensures the collar doors can only be opened with the drawer in the safe position.

h. Top plug rest and safety column ensure the top plug can only be opened with the drawer in the full up position.

6. SAFETY/EMERGENCY PROCEDURES

a. The GC-220 shall be operated as described in the Atomic Energy of Canada Limited "Operator's Manual for the Gammacell 220 Cobalt 60 Irradiation Unit," edition 7, February 1978, and in accordance with this Standard Operating Procedure.

b. Emergency Procedures: See Annex A of this Standing Operating Procedure.

c. No individual shall undertake repair, perform any maintenance, remove any interlock and/or safety device, or make any changes in and/or on the GC-220 without prior approval of the authorized Principal User and the Health Physics Officer, WRAMC.

d. Under NO circumstances shall explosive material be irradiated in the GC-220.

e. All operators and/or assistants shall wear personnel monitoring devices while working around and/or operating the GC-220 Irradiator.

f. Health Physics, WRAMC, will perform leak tests, periodic inspections and radiation protection surveys.

g. An operating log shall be maintained by the authorized Principal User.

h. Key Control:

(1) Operating keys will be held under direct supervision of the authorized Principal User approved by the WRAMC Radiation Control Committee. The Principal User is responsible for assuring proper key control and key security.

(2) Duplicate keys for the GC-220 and GC-40 will be secured by the authorized Principal User.

7. REFERENCES

a. Atomic Energy of Canada Limited "Operator's Manual for the Gammacell 220 Cobalt 60 Irradiation Unit," edition 7, February 1978.

b. Nuclear Regulatory Commission By-Product Material License No. 08-01738-03.

1 Incl
ANNEX A - Emergency Procedures
for AECL Gammacell
220 Irradiator

HSWP-QHP
ANNEX A to Health Physics SOP Number

EMERGENCY PROCEDURES
FOR
AECL GAMMACELL 220 IRRADIATOR

1. In the event of an emergency, malfunction, or other unusual occurrence, the following individuals shall be notified after turning the console to the OFF position:

a. Authorized Principal User, WRAIR, Extension 576-3428.

b. Radiation Protection Officer, WRAIR, Extension 576-3428.

c. Health Physics Officer, WRAMC, Extension 301-427-5107.

d. Staff Duty Officer, WRAMC (after duty hours), Extension 576-3501/2309.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority.

2. In the event of a fire, the following individuals shall be notified:

a. Fire Department, WRAMC, Extension 576-3317.

b. Authorized Principal User, WRAIR, Extension 576-3428.

c. Radiation Protection Officer, WRAIR, Extension 576-3428.

d. Health Physics Officer, WRAMC, Extension 301-427-5107.

e. Staff Duty Officer, WRAMC (after duty hours), Extension 576-3501/2309.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority. Fire fighters may enter the area after the radiation hazard has been determined. There is little likelihood of radiation hazard unless the temperature of the source shield reaches the melting point of lead (621°F). Water should be sprayed on the source shield if there is any possibility of the temperature approaching this value.

3. Following an emergency the GC-220 shall not be operated until an inspection and a radiation protection survey have been conducted by WRAMC Health Physics.

HSWP-QHP
ANNEX A to Health Physics SOP Number

EMERGENCY PROCEDURES
FOR
AECL GAMMACELL 220 IRRADIATOR

1. In the event of an emergency, malfunction, or other unusual occurrence, the following individuals shall be notified after turning the console to the OFF position:

a. Authorized Principal User, USAMRIID, Extension 7241.

b. Health Physics Officer, WRAMC, Phone 301-427-5107.

c. Safety Officer, USAMRIID, Extension 7373.

d. Staff Duty NCO, USAMRIID (after duty hours), Extension 7335.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority.

2. In the event of fire the following individuals shall be notified:

a. Fire Department, Fort Detrick, Extension 7333.

b. Authorized Principal User, USAMRIID, Extension 7241.

c. Health Physics Officer, WRAMC, Phone 301-427-5107.

d. Safety Officer, USAMRIID, Extension 7373.

e. Staff Duty NCO, USAMRIID (after duty hours), Extension 7335.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority. Fire Fighters may enter the area after the radiation hazard has been determined. There is little likelihood of radiation hazard unless the temperature of the source shield reaches the melting point of lead (621°F). Water should be sprayed on the source field if there is any possibility of the temperature approaching this value.

3. Following an emergency the GC-220 shall not be operated until an inspection and a radiation protection survey have been conducted by WRAMC Health Physics.

HEALTH PHYSICS
WALTER REED ARMY MEDICAL CENTER
Washington, D.C. 20012

HSWP-QHP
SOP Number

OPERATING AND SAFETY PROCEDURES FOR AECL GAMMACELL 40 IRRADIATOR

1. GENERAL

a. The Gammacell 40 (GC-40) shall be used (operated) by, or under the direct supervision of individuals designated by the Walter Reed Army Medical Center (WRAMC) Radiation Control Committee, Deputy Commander, WRAMC, Chairman.

b. The authorized Principal User is directly responsible for the control and safe use of this irradiator and will designate individuals to operate the GC-40 as approved by the WRAMC Radiation Control Committee.

c. The GC-40 shall be used for medical research and development in radiation biology and radiation dosimetry.

2. DEFINITIONS

Because the precise meaning given to one or more critical terms frequently determines the interpretation of a statement, the following definitions are given for certain words and phrases as they are used in this document:

a. "Shall" - denotes that the ensuing recommendation is necessary or essential to meet the currently accepted standards of radiation protection.

b. "Should" (is recommended) - indicates advisory recommendations that are to be applied when practicable.

c. "Explosive" - explosives are either solid or liquid, either mixtures or single compounds, and act by explosive chemical reaction, liberating at high speed heat and gas, which causes tremendous pressure.

d. "Flammable" - materials capable of being easily ignited; preferred to "inflammable", because of possible ambiguity of the in prefix.

HEALTH PHYSICS
WALTER REED ARMY MEDICAL CENTER
Washington, D.C. 20012

HSWP-QHP
SOP Number

OPERATING AND SAFETY PROCEDURES FOR AECL GAMMACELL 40 IRRADIATOR

1. GENERAL

a. The Gammacell 40 (GC-40) shall be used (operated) by, or under the direct supervision of individuals designated by the Walter Reed Army Medical Center (WRAMC) Radiation Control Committee, Deputy Commander, WRAMC, Chairman.

b. The authorized Principal User is directly responsible for the control and safe use of this irradiator and will designate individuals to operate the GC-40 as approved by the WRAMC Radiation Control Committee.

c. The GC-40 shall be used for medical research and development in radiation biology and radiation dosimetry.

2. DEFINITIONS

Because the precise meaning given to one or more critical terms frequently determines the interpretation of a statement, the following definitions are given for certain words and phrases as they are used in this document:

a. "Shall" - denotes that the ensuing recommendation is necessary or essential to meet the currently accepted standards of radiation protection.

b. "Should" (is recommended) - indicates advisory recommendations that are to be applied when practicable.

c. "Explosive" - explosives are either solid or liquid, either mixtures or single compounds, and act by explosive chemical reaction, liberating at high speed heat and gas, which causes tremendous pressure.

d. "Flammable" - materials capable of being easily ignited; preferred to "inflammable", because of possible ambiguity of the in prefix.

e. "Individual" and/or "Operator" - a person designated by the authorized Principal User, as approved by the WRAMC Radiation Control Committee, to operate the AECL Gammacell 40 Irradiator.

f. "Emergency" - an unforeseen combination of circumstances (e.g., failure of an interlock or safety device, fire, ruptured or leaking source, etc.) that pose a threat to personnel or property by ionizing radiation.

3. RESPONSIBILITIES

a. The authorized Principal User:

(1) Ensuring that the GC-40 is operated only by individuals authorized to do so by the WRAMC Radiation Control Committee, and in accordance with the conditions of the WRAMC Radioactive Material authorization.

(2) Instruction of individuals in safe operating procedures in accordance with instructions outlined herein. He shall promulgate rules for working safety, including any restrictions of the operating technique known to be necessary.

(3) Ensuring that these instructions and references contained in para 7 are available at the GC-40 unit at all times.

(4) Promptly reporting any source malfunction, accident, or other unplanned occurrence that could result in an unsafe condition or exposure to personnel to the WRAMC Health Physics Officer (301-427-5107).

(5) Assuring that all personnel operating the unit are monitored by appropriate personnel monitoring devices.

(6) Ensuring that personnel operating the unit have been instructed in the hazards and nature of injuries resulting from overexposure to ionizing radiation (e.g., attendance at appropriate WRAMC personnel training programs - HSWP-QHP Memo No. 2)

b. WRAMC Health Physics:

(1) Conducting routine radiation protection surveys and inspections.

(2) Providing technical assistance as required.

(3) Providing calibration and routine maintenance services for radiation detection and measuring instruments.

c. Individual Operators:

(1) Operating the unit in accordance with the operation and safety procedures delineated in this SOP.

(2) Recording all pertinent information in the operating log maintained by the authorized Principal User.

(3) Being familiar with the content of these instructions, requirements of the WRAMC authorization, and other regulations as may be prescribed by the authorized Principal User.

(4) Locking the GC-40 unit and the room upon completion of use.

(5) Ensuring that the keys to the unit and the room door are properly secured to prevent unauthorized use.

(6) Reporting all malfunctions, accidents, and any other unplanned occurrence that could result in an unsafe condition or exposure of personnel promptly to the authorized Principal User.

4. OPERATION PROCEDURES

a. Insert key in the keyswitch and turn clockwise to the ON position.

b. Open the sample cavity door by holding in the door lock pushbutton and pulling on the door handle.

c. Remove the sample tray by pushing up from the underside.

d. Place the object to be irradiated in the sample tray and cover with the lid.

e. Replace the sample tray in the sample cavity ring.

f. "Chamber Air" - if ventilation to the sample cavity is required, press the "Chamber Air" button on the control panel which will illuminate white when ventilation air supply is on.

g. Close the sample cavity door and lock making sure it latches.

h. If automatic operation is desired:

(1) Press the Manual/Auto selector switch until the Auto portion of the switch is illuminated.

(2) Set the desired time interval on the timer counter. This is achieved by holding in the red reset button located at the left of the digit windows, and depressing the timer selector buttons until the desired numerals appear. Release the red button.

(3) Press the "Source on" pushbutton, both sources will move to the irradiate position and the timer will start. At the end of the preset time the source drawers will automatically move to their fully shielded safe storage position.

i. If manual operation is desired press the Manual/Auto selector switch until the manual portion of the switch is illuminated, then press the "Source On" pushbutton. The sources will remain in the irradiate position until the "Source Off" switch is operated.

5. SAFETY FEATURES

Several safety features have been incorporated into the unit for the protection of operating personnel:

a. The source drawers are mechanically interlocked with the sample cavity door to ensure that:

(1) The sample cavity door cannot be opened when the source drawers are in the irradiate position.

(2) The source drawers cannot move into the irradiate position when the sample cavity door is open, or is not completely closed.

b. The mechanical lock on the sample cavity door is electrically interlocked to prevent the door from being opened when either source is not in its fully shielded safe storage position.

c. In the event of a power failure occurring during an irradiation, the source drawers will automatically return to the safe position. After power is restored, the "Source On" pushbutton must be pressed to continue the irradiation.

d. A pressure sensing switch is incorporated in the pneumatic system which will cause the source drawers to return to the safe position if the air pressure drops below 40 psig. Should this situation occur, the Low Air Indicator lamp on the control panel will be illuminated.

6. SAFETY/EMERGENCY PROCEDURES

a. The GC-40 shall be operated as described in the Atomic Energy of Canada Limited "Instruction Manual Gammacell 40 Caesium 137 Irradiation Unit," edition No. 3, September 1977, and in accordance with this Standing Operating Procedure.

b. Emergency Procedures: See Annex A of this Standing Operating Procedure.

c. No individual shall undertake repair, perform any maintenance, remove any interlock and/or safety device, or make any changes in and/or on the GC-40 without prior approval of the authorized Principal User and the Health Physics Officer, WRAMC.

d. Under NO circumstances shall explosive material be irradiated in the GC-40.

e. All operators and/or assistants shall wear personnel monitoring devices while working around and/or operating the GC-40 irradiator.

f. Health Physics, WRAMC, will perform leak tests, periodic inspections and radiation protection surveys.

g. An operating log shall be maintained by the authorized Principal User.

h. Key Control:

(1) Operating keys will be held under direct supervision of the authorized Principal User approved by the WRAMC Radiation Control Committee. The Principal User is responsible for assuring proper key control and key security.

(2) Duplicate keys for the GC-220 and GC-40 will be secured by the authorized Principal User.

7. REFERENCES

a. Atomic Energy of Canada Limited "Instruction Manual Gammacell 40 Caesium 137 Irradiation Unit," edition No. 3, September 1977.

b. Nuclear Regulatory Commission By-Product Material License No. 08-01738-03.

1 Incl
ANNEX A - Emergency Procedures
for AECL Gammacell
40 Irradiator

HSWP-QHP
ANNEX A to Health Physics SOP Number

EMERGENCY PROCEDURES
FOR
AECL GAMMACELL 40 IRRADIATOR

1. In the event of an emergency, malfunction, or other unusual occurrence, the following individuals shall be notified after pressing the "Source Off" switch:

a. Authorized Principal User, USAMRIID, Extension 7241.

b. Health Physics Officer, WRAMC, Phone 301-427-5107.

c. Safety Officer, USAMRIID, Extension 7373.

d. Staff Duty NCO, USAMRIID (after duty hours), Extension 7335.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority.

2. In the event of fire the following individuals shall be notified:

a. Fire Department, Fort Detrick, Extension 7333.

b. Authorized Principal User, USAMRIID, Extension 7241.

c. Health Physics Officer, WRAMC, Phone 301-427-5107.

d. Safety Officer, USAMRIID, Extension 7373.

e. Staff Duty NCO, USAMRIID (after duty hours), Extension 7335.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority. Fire fighters may enter the area after the radiation hazard has been determined. There is little likelihood of radiation hazard unless the temperature of the source shield reaches the melting point of lead (621°F). Water should be sprayed on the source shield if there is any possibility of the temperature approaching this value.

3. Following an emergency the GC-40 shall not be operated until an inspection and a radiation protection survey have been conducted by WRAMC Health Physics.

HSWP-QHP
ANNEX A to Health Physics SOP Number

EMERGENCY PROCEDURES
FOR
AECL GAMMACELL 40 IRRADIATOR

1. In the event of an emergency, malfunction, or other unusual occurrence, the following individuals shall be notified after pressing the "Source Off" switch:

a. Authorized Principal User, WRAIR, Extension 576-3428.

b. Radiation Protection Officer, WRAIR, Extension 576-3428.

c. Health Physics Officer, WRAMC, Extension 301-427-5107.

d. Staff Duty Officer, WRAMC (after duty hours), Extension 576-3501/2309.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority.

2. In the event of a fire, the following individuals shall be notified:

a. Fire Department, WRAMC, Extension 576-3317.

b. Authorized Principal User, WRAIR, Extension 576-3428.

c. Radiation Protection Officer, WRAIR, Extension 576-3428.

d. Health Physics Officer, WRAMC, Extension 301-427-5107.

e. Staff Duty Officer, WRAMC (after duty hours), Extension 576-3501/2309.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority. Fire fighters may enter the area after the radiation hazard has been determined. There is little likelihood of radiation hazard unless the temperature of the source shield reaches the melting point of lead (621°F). Water should be sprayed on the source shield if there is an possibility of the temperature approaching this value.

3. Following an emergency the GC-40 shall not be operated until an inspection and a radiation protection survey have been conducted by WRAMC Health Physics

HEALTH PHYSICS
WALTER REED ARMY MEDICAL CENTER
Washington, D.C. 20012

HSWP-QHP
*SOP Number 1-6

16 July 1980

LEAK TESTING AND INVENTORY OF SEALED SOURCES

1. PURPOSE. The purpose of this SOP is to provide continuity in the standard leak testing procedures for sealed sources containing alpha, beta and/or gamma emitting radionuclides possessed, used and stored at WRAMC and tenant activities.

2. GENERAL.

a. Despite the fact that many precautions are taken to prevent leakage, the radioactive materials do occasionally leak from the capsule. Radioactive material which leaks from a source is a hazard in that it may become airborne or transported in some other way to become inhaled or ingested by personnel. The purpose of leak-testing sealed sources is to detect the leakage of the radionuclide before it becomes a hazard, and to comply with applicable regulations.

b. All sources at WRAMC will be leak-tested by the Health Physics Office Operations Branch.

c. Where a conflict of regulations (to include applicable USNRC Licenses and DA Authorizations) exists, the more restrictive regulation will be followed.

d. Sealed Source means any radioactive material that is inclosed in, or is to be used in, a container in a manner intended to prevent leakage of the radioactive material or any of its daughter products.

e. Leak Test Requirements:

(1) Each sealed source acquired by WRAMC and containing radioactive material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for contamination and/or leakage prior to use. In the absence of a certificate from a transferor indicating that a test has been made within six months prior to the transfer, the sealed source shall not be put into use until tested.

(2) Any licensed sealed source is exempt from such leak tests when the source contains 100 microcuries or less of beta and/or gamma emitting material or 10 microcuries or less of alpha emitting material.

(3) Except for alpha sources, the periodic leak test requirement specified below does not apply to sealed sources that are stored and not being used. The sources excepted from this test shall be tested for leakage prior to any use or transfer to another person unless they have been leak tested within six months prior to the date of use or transfer.

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* This SOP supersedes HP SOP 1-6 dated 3 November 1977

(4) Each sealed source containing by-product material, other than Hydrogen 3, with a half-life greater than thirty days and in any form other than gas shall be tested for leakage and/or contamination at intervals not to exceed six months except that each source designed for the purpose of emitting alpha particles shall be tested at intervals not to exceed three months.

(5) The test shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. The test sample shall be taken from the sealed source or from the surfaces of the device in which the sealed source is permanently or semipermanently mounted or stored on which one might expect contamination to accumulate. Records of leak test results shall be kept in units of microcuries and maintained by the Health Physics Office.

f. If there is reason to suspect that a sealed source might have been damaged, it will be tested for leakage before further use.

g. All sealed sources found to be leaking and/or contaminated will be immediately withdrawn from use by Health Physics. The Health Physics Officer will determine whether or not the source is leaking. It it is leaking, he will direct that it be resealed or disposed of in accordance with existing regulations.

3. SAFETY.

a. Appropriate safety measures will be observed while performing leak tests to minimize personnel exposures. Such measures will maximize the use of time, distance and shielding.

b. High intensity sources such as brachytherapy sources will not be touched. They will be handled with remote handling devices or longhandled forceps.

c. Appropriate personnel monitoring devices such as whole-body film badges, wrist film badges and self-reading dosimeters will be worn while performing leak tests.

4. LEAK TESTING METHODS.

a. In general, alpha, beta and gamma sealed sources are leak tested by taking a one (1) inch diameter filter paper disc and obtaining a dry or wet wipe of accessible areas of the source or source holder in which the source is permanently mounted. When taking wet wipes the solution used should not be harmful to the source capsule or holder. All exposed surfaces of the source or holder will be wiped. Paper wipes will be placed in paper envelopes or plastic bags and sent for Laboratory analysis. Care will be taken to avoid cross-contamination.

b. Radium Sources.

(1) Brachytherapy sources (Charcoal Adsorption Test) - Approximately 1/2 gram of activated charcoal is placed in a capped/stoppered glass tube. A wad of cotton is placed over the charcoal to separate charcoal and source. The source will remain in the sealed tube for at least 24 hours. After 24 hours, uncap the

tube, remove the source, immediately reseal the tube and send sample to Laboratory for analysis. A blank charcoal control sample will be send along with each sample to distinguish environmental Radon from that produced by the source.

(2) Other radium sources - Sources too large to be tested by the method outlined in b(1), above, will be tested by using a sealable plastic bag in place of the glass tube. All other procedures will be the same as b(1).

c. Gamma Irradiators (AECL Gammacells) - Dry paper wipes will be obtained from the following locations if they are accessible:

(1) Upper external ram.

(2) Inside the irradiator chamber.

(3) Lower external ram.

(4) Floor beneath the ram.

Leak testing will be performed with the source in the unexposed position.

d. Gamma teletherapy and gamma calibration units - Dry paper wipes will be taken from selected accessible surfaces of the teletherapy head or beam port. Surfaces wiped will be those which would most likely become contaminated in case of source leakage and will include inner surfaces of beam collimating device. Extreme care will be taken not to damage or displace aiming devices during the procedures. Testing will be performed with the source in the unexposed position.

5. SAMPLE PROCESSING.

a. All samples will be forwarded to the Laboratory for quantitative analysis. Samples will be identified by the Health Physics Control Number of the source tested.

b. Data furnished for samples taken by the Charcoal Adsorption Test will include the time when the source was removed from the glass tube.

c. Samples will be analyzed by the Laboratory using appropriate methods and results will be returned to requestor.

6. EVALUATION.

a. Radium Sources - If any leakage is detected above minimum detectable activity, the source will be suspected of leaking and will be retested. The maximum value of leakage acceptable will be less than 0.001 microcuries (2.22×10^3 dpm).

b. Other Sources - If any leakage is detected above minimum detectable activity, the source will be suspected of leaking and will be retested. The maximum value of leakage acceptable will be less than 0.05 microcuries of removable contamination.

7. DISPOSAL OF LEAKING SOURCES.

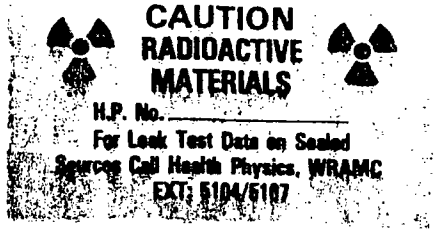
All sources found to be leaking greater than the values specified in para 6, above, will be handled in accordance with 10CFR 34.25 and 10 CFR 20, and will be immediately withdrawn from use, decontaminated and repaired or disposed of in accordance with applicable Federal, Army and State regulations.

8. Inventory of Leak Testing Records and Sealed Sources.

a. The leak testing procedure as specified in para 2e of this SOP shall constitute the inventory of sealed sources required by 10 CFR 34.25.

b. Each accountable sealed source as specified in para 2e at WRAMC will be assigned a Health Physics control number by the Radioactive Materials Control Branch.

c. Each sealed source or its container will be labeled as shown below with the Health Physics control number for that source:



d. A Record of Sealed Source Inventory and Leak Testing for each sealed source will be maintained by the Radioactive Materials Control Branch. The Record of Sealed Source Inventory and Leak Testing will contain the following information:

(1) Specific items of equipment or radioisotope

(2) Serial number

(3) Health Physics control number

(4) Location of the items

(5) Radiation levels

(6) Radioactivity

(7) NRC or DA authorization numbers

(8) Receipts, transfers, and local disposals

(9) Date of inventory and name of person making the inventory

(10) WRAMC Radioactive Material Authorization number

e. The Record of Sealed Source Inventory and Leak Testing will also serve as a record of leak testing. Consecutive entries will be made for each test and include the date, activity detected in microcuries, and initials of person performing test.

9. REFERENCES.

a. Title 10, Code of Federal Regulation, US NRC.

b. AR 40-37, Radioisotope License Program (Human-Use), 7 January 1977.

c. AR 385-11, Safety - Ionizing Radiation Protection, 1 May 1980.

d. TB MED 249 (NBSH-73), Protection Against Radiation from Sealed Gamma Sources.

e. TB MED 62, Diagnostic X-ray, Therapeutic X-ray and Gamma-Beam Protection for Energies Up to 10 Million Electron Volts.

f. NRCP Reports 28, 30, 33, 34, 40 and 41.

g. NBS Handbook 114.

Dennis A. Stevenson

DENNIS A. STEVENSON
CPT, MSC
Health Physics Officer

CURRICULUM VITAE

NAME: DENNIS A. STEVENSON
CPT, MSC

Current Duty Assignment: Health Physics Officer
Walter Reed Army Medical Center
Washington, D.C. 20012

Home Address:
Legal Residence
Date of Birth:
Place of Birth:

Home Telephone Number:

Office Telephone Number: (301) 427-5161

EDUCATION:

Ph.D.	Physics (Biophysics)	University of Delaware Newark, Delaware 19711
M.S.	Physics (Biophysics)	University of Delaware Newark, Delaware 19711
B.A.	Physics	Gettysburg College Gettysburg, PA

EXPERIENCE:

July 1980 - Walter Reed Army Medical Center
Health Physics Officer/Radiation Protection Officer

1977 - July 1980 Walter Reed Army Medical Center
Assistant Health Physics Officer
Alternate Radiation Protection Officer
Chief, Technical Services Branch

1977 AMEDD Officer Basic MSC Course
Fort Sam Houston, Texas

1973 - 1977 Assistant Professor of Physics
Northeast Louisiana University
Monroe, Louisiana 71209
(Radiation Safety Officer - 1976 to 1977)

1972 - 1973 Research Associate
Department of Biophysics and Microbiology
University of Pittsburgh, Pittsburgh, PA

Physical studies of Tobacco Mosaic Virus (TMV), polymerization-depolymerization of TMV protein, and the reconstitution of the component proteins and nucleic acid into a virus particle. These studies involved the use of the following techniques: electrophoresis, acid-base titration, ultracentrifugation, spectroscopy, electron microscopy, and radioisotopes.

STEVENSON, Dennis A. (continuation of Curriculum Vitae)

1966 - 1972	Graduate Student Department of Physics University of Delaware Newark, Delaware 19711
Summers 1966 1965	Physicist Aberdeen Proving Ground, MD A study of atmospheric turbulence using the propagation of a laser beam through the atmosphere.

ADDITIONAL RELEVANT EXPERIENCE:

1976 - 1977	Radiation Safety Officer Northeast Louisiana University Monroe, Louisiana 71209
1973 - 1977	Designed and taught an X-ray physics class for radiologic technicians in training at several local hospitals. The course included physical and clinical aspects of X-ray technology. (2 semester course).
1974 - 1977	Designed and taught a graduate-undergraduate level biophysics course. The course involved a study of the physical properties of large biologically important molecules and the application of the concepts and techniques of physics in the study of biological systems.
1977	Designed and taught a graduate level biophysics laboratory course. The course included spectroscopy, radionuclide techniques, radiation effects and electron microscopy.
1974	Designed and taught a special graduate level course for state public health personnel working toward a graduate degree in biology. The course included the physical study of ionizing radiation and its effect on biological systems from the cellular level to man as well as the instruments used to detect and monitor these radiations.
1975 - 1977	Director of NSF sponsored program entitled "Selected Biomedical Applications of Physics" for outstanding high school juniors from throughout U.S.A.

STEVENSON, Dennis A. (continuation of Curriculum Vitae)

OTHER EDUCATION AND TRAINING:

1974	Biomedical Aspects of Environmental Pollution Course, Oak Ridge, TN
1976	External Beam, Interstitial and Intercavitary Dosimetry -- (1) Principles Course (2) Manual and Computer Methods of Calculation The University of Texas Health Science Center at Houston, MD Anderson Hospital and Tumor Institute Houston, Texas
1978	The Medical Effects of Nuclear Weapons Course Armed Forces Radiobiology Research Institute Defense Nuclear Agency Bethesda, MD 20014
1978	Laser and Microwave Hazards Course US Army Environmental Hygiene Agency Aberdeen Proving Ground, Maryland 21005
1978	Medical X-Ray Survey Techniques Course Academy of Health Sciences Fort Sam Houston, Texas 78234
1978	Nuclear Emergency Training Exercise (NETEX) Interservice Nuclear Weapons School Kirtland AFB, New Mexico
1978	Nuclear Hazards Training Course (NHTC) Interservice Nuclear Weapons School Kirtland AFB, New Mexico
1979	Health Physics in Radiation Accidents Course Oak Ridge Associated Universities Oak Ridge, Tennessee
1979	Nuclear Weapons Accident Exercise (NUWAX) DOD/DOE National Exercise Nevada Test Site, Nevada Position: Radiological Advisory Medical Team Leader

STEVENSON, Dennis A. (continuation of Curriculum Vitae)

PUBLICATIONS:

Ph.D. Thesis
"The Influence of Temperature on Globular Protein-Polyribonucleotide Interactions"

M.S. Thesis
"The Effect of Damaged Proteins on the Light Scattering Properties of Ribonucleic Acid Solutions-A Comparison of Ultraviolet and Ionizing Radiation Effects"

Preiss, John W. and Dennis A. Stevenson, "Some Parallelisms in the Behavior of Pancreatic Ribonuclease and Chicken Lysozyme Toward Homopolyribonucleotides," Biophysical Journal, 12, p.80 (1972)

Stevenson, Dennis A. and John W. Preiss, "Temperature Variation of Polyribonucleotide Conformation by an Interaction with Basic Globular Proteins," Biophysical Journal, 13, p.470 (1973)

Shugart, Cecil G., Ronald E. Smith, Larry D. Johnson, John H. Myers, and Dennis A. Stevenson. 1975. Physical Science Lab Manual. Kendall/Hunt Pub. Co., Iowa

Stevenson, Dennis A., "Biophysics of the Eye," The Louisana Physics Teacher, 5, p.2 (1975)

MEMBERSHIP (Professional & Technical Societies/Committees)

Societies:

Biophysical Society
The American Physical Society
American Association for the Advancement of Science
Sigma Xi - The Scientific Research Society of North America
Sigma Pi Sigma - National Physics Honor Society
Health Physics Society

Committees:

Radiation Control Committee (Member/Recorder), Walter Reed Army Medical Center
Radioactive Drug Research Committee (Member), Walter Reed Army Medical Center
Clinical Investigations Committee, Walter Reed Army Medical Center

DEPARTMENT OF THE ARMY
WALTER REED ARMY MEDICAL CENTER
WASHINGTON, D.C. 20012

IN REPLY REFER TO

HSWP-QHP

APR 4 1979

SUBJECT: Amendment of USNRC License 08-01738-03

THRU: Commander
US Army Health Service Command
ATTN: HSPA-P
Fort Sam Houston, TX 78234

16 Apr 79

TSG HQDA (DASG-PSP-E)
Washington, DC 20310

24 Apr 79

TO: Director
Division of Fuel Cycle and Material Safety
Office of Nuclear Material Safety and Safeguards
US Nuclear Regulatory Commission
Washington, DC 20555

1. Request that USNRC Byproduct License 08-01738-03, Expiration Date: 31 August 1980, be amended as follows:

a. Item 6. Add: D. Cobalt 60
E. Cesium 137

b. Item 7. Add: D. Sealed Sources (AECL Model C 198)
E. Sealed Sources (AECL Model C 161-Type 8)

c. Item 8. Add: D. 26,400 Curies (no single source to exceed 26,400 Curies)
E. 4200 Curies (no single source to exceed 2100 Curies)

d. Item 9. Add: D. To be used in AECL Gammacell 220 Irradiator located in Building 1425, US Army Research Institute of Infectious Diseases, Ft. Detrick, Frederick, MD 21701, for medical research and development and radiation dosimetry.

E. To be used in AECL Gammacell 40 Irradiator located in Building 1425, US Army Research Institute of Infectious Diseases, Ft. Detrick, Frederick, MD 21701, for medical

HSWP-QHP
SUBJECT: Amendemnt of USNRC License 08-01738-03

research and development and radiation dosimetry.

Change: B. To be stored in AECL Gammacell 220 Irradiator, located in Building 500, Forest Glen Section, WRAMC, Montgomery County, Maryland, pending disposal of the unit.

2. The AECL Gammacell 220 unit will be operated in accordance with the AECL Operator's Manual for the Gammacell 220 Cobalt 60 Irradiation Unit, Edition 7, dated Feb 1978, and the USAMRIID SOP (inclosure 1). The AECL Gammacell 40 will be operated in accordance with AECL Instruction Manual, Gammacell 40 Caesium 137 Irradiation Unit, Edition 3, September 1977 and the USAMRIID SOP (inclosure 2).

3. Additional supporting documentation required for this request is to be found currently on file with the NRC as supporting documents for USNRC License 08-01738-03 and in the inclosures 3 through 10.

4. Any questions or comments pertaining to this request should be directed to the Health Physics Officer, Walter Reed Army Medical Center, Washington, DC 20012. (Telephone commercial 301-427-5161, Autovon 291-5161)

FOR THE COMMANDER:

FRANKLIN J. GORTOP
MAJ, MSC
Adjutant

10 Incl
1. USAMRIID SOP: Operating and Safety Procedures for AECL Gammacell 220 Irradiator dated 13 Feb 79
2. USAMRIID SOP: Operating and Safety Procedures for AECL Gammacell 40 Irradiator dated 13 Feb 79
3. Drawing and description of proposed location of irradiators
4. AECL authorization letters for A.N. Thurley and W.C. Doherty (installers)
5. Resumes of qualifications and experience for A.N. Thurley and W.C. Doherty
6. USNRC Byproduct Material License 54-00300-12
7. DOT Certificate for F-147 Transfer Case-USA/6355/B
8. Canadian Certificate for F-147 Transfer Case-CDN/2009/B(u)T
9. DOT Certificate for AECL Gammacell 220-USA/6125/B(u)T
10. Canadian Certificate for AECL Gammacell 220-CDN/2013/B(u)T

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES
FORT DETRICK, FREDERICK, MARYLAND 21701

STANDING OPERATING PROCEDURE 13 February 1979

OPERATING AND SAFETY PROCEDURES FOR AECL GAMMACELL 220 IRRADIATOR

1. GENERAL.

a. The Gammacell 220 (GC-220) shall be used (operated) by, or under the supervision of individuals designated by the Walter Reed Army Medical Center (WRAMC) Radiation Control Committee, Deputy Commander, WRAMC, Chairman.

b. The Chief, Animal Assessment Division, USAMRIID is directly responsible for the control and safe use of this irradiator and will designate individuals to operate the GC-220 as approved by the WRAMC Radiation Control Committee.

c. The GC-220 shall be used for medical research and development in radiation biology and radiation dosimetry.

2. DEFINITIONS.

Because the precise meaning given to one or more critical terms frequently determines the interpretation of a statement, the following definitions are given for certain words and phrases as they are used in this document.

a. "Shall" - denotes that the ensuing recommendation is necessary or essential to meet the currently accepted standards of radiation protection.

b. "Should" (is recommended) - indicates advisory recommendations that are to be applied when practicable.

c. "Explosive" - explosives are either solid or liquid, either mixtures or single compounds, and act by explosive chemical reaction, liberating at high speed heat and gas, which causes tremendous pressure.

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d. "Flammable" - materials capable of being easily ignited; preferred to "inflammable" because of possible ambiguity of the in prefix.

e. "Individual" and/or "Operator" - a person designated by the Chief, Animal Assessment Division, USAMRIID, as approved by the WRAMC Radiation Control Committee, to operate the AECL Gammacell 220 Irradiator.

f. "Emergency" - an unforeseen combination of circumstances (e.g., failure of an interlock or safety device, fire, ruptured or leaking source, etc.) that poses a threat to personnel or property by ionizing radiation.

3. RESPONSIBILITIES.

a. The Chief, Animal Assessment Division, USAMRIID:

(1) Ensuring that the GC-220 is operated only by individuals authorized to do so by the WRAMC Radiation Control Committee.

(2) Instruction of individuals in safe operating procedures in accordance with instructions outlined herein. He shall promulgate rules for working safety, including any restrictions of the operating technique known to be necessary.

(3) Ensuring that these instructions and references contained in para 7 are available at the GC-220 unit at all times.

(4) Promptly reporting any source malfunction, accident, or other unplanned occurrence that could result in an unsafe condition or exposure to personnel to the WRAMC Health Physics Officer (6-427-5107).

b. WRAMC Health Physics:

(1) Conducting routine radiation protection surveys and inspections.

(2) Providing personnel dosimetry for all personnel operating the unit.

(3) Instructing operating personnel in the hazards and nature of injuries resulting from overexposure to ionizing radiation.

(4) Providing technical assistance as required.

(5) Providing calibration and routine maintenance services for radiation detection and measuring instruments.

c. Individual operators:

(1) Operating the unit in a safe manner at all times.

(2) Being familiar with the content of these instructions, requirements of the WRAMC authorization, and other regulations as may be prescribed by the Chief, Animal Assessment Division, USAMRIID.

(3) Locking the GC-220 unit and the room upon completion of use.

(4) Ensuring that the keys to the unit and the room door are properly secured to prevent unauthorized use.

(5) Reporting all malfunctions, accidents, and any other unplanned occurrence that could result in an unsafe condition or exposure of personnel promptly to the Chief, Animal Assessment Division, USAMRIID.

4. OPERATING PROCEDUURES.

a. Insert key in keyswitch and turn clockwise 90^{o}.

b. Raise the drawer by pressing the UP rocker switch.

c. To open the collar doors, press and hold in the button on the top of the door interlock, grasp the right hand door handle, pull back the latch lever, release the button and pull the doors open.

d. Slide the sample chamber locking ring to the right, remove the door by lifting it up and outwards.

e. Place the sample in the chamber. The access tube in the drawer top accommodates accessory tubes and electrical leads, which should be fitted in accordance with the instructions provided in the Gammacell 220 Accessories Manual.

f. Replace the sample chamber door with a forward and downward motion. Move the locking ring to the left until it snaps into position. If difficulties are experienced, check that the door is correctly positioned in the port.

g. To close the collar doors, press and hold in the button on the top of the door interlock. Grasp the right hand door handle, pull back the latch lever, release the button and push the doors closed.

h. If automatic operation is desired set the irradiation time in the following manner:

(1) Push the timer reset knob, turn it clockwise 90 , and release; the white line on the knob should be horizontal.

(2) Open the hinged cover which protects the predetermining drums; turn the knurled wheels either direction until the desired number sequence appears in the windows.

(3) Rotate the selector switch to hours, minutes or seconds. Close the hinged cover and turn the timer reset knob counterclockwise; the white line on the knob should be vertical, press the reset knob to set the timer.

(4) Push the DOWN switch. The drawer will lower to the irradiating position, activate the timer, and remain there until the preset time interval has elapsed, when it will automatically raise.

i. If manual operation is desired rotate the selector switch to MANUAL and press the DOWN switch. The drawer will lower and remain there indefinitely until the UP switch is operated.

j. To remove the sample repeat steps b - d.

5. SAFETY FEATURES.

There are a variety of safety features incorporated into the unit for the protection of the operator.

a. Three microswitches are mounted on the collar door to ensure that:

(1) The sample chamber door is properly located.

(2) The locking ring is in position.

(3) Both collar doors are closed.

b. A fourth microswitch is located on the top shielding plug to ensure that the plug is closed.

c. Unless all four microswitches are actuated the drive motor will not start.

d. The self-locking feature of the worm gear reducer acts as a brake to prevent the drawer moving down under its own weight.

e. A solenoid-operated ram prevents the sample drawer moving down in the event of a drive system mechanical failure.

f. Drawer movement can be arrested by switching off the electrical supply key switch.

g. A solenoid-operated door interlock ensures the collar doors can only be opened with the drawer in the safe position.

h. Top plug rest and safety column ensure the top plug can only be opened with the drawer in the full up position.

6. SAFETY PROCEDURES.

a. The GC-220 shall be operated as described in the Atomic Energy of Canada Limited "Operator's Manual for the Gammacell 220 Cobalt 60 Irradiation Unit," edition 7, February 1978, and in accordance with this Standard Operating Procedure.

b. In the event of an emergency, malfunction, or other unusual occurrence, the following individuals shall be notified after turning the console to the OFF position:

(1) Chief, Animal Assessment Division, USAMRIID, Extension 7244.

(2) Health Physics Officer, WRAMC, Phone 6-427-5107.

(3) Safety Officer, USAMRIID, Extension 7373.

(4) Staff Duty Officer, USAMRIID (after duty hours) Extension 7335.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority.

c. In the event of fire the following individuals shall be notified:

(1) Fire Department, Fort Detrick, Extension 7333.

(2) Chief, Animal Assessment Division, USAMRIID, Extension 7244.

(3) Health Physics Officer, WRAMC, Phone 6-427-5107.

(4) Safety Officer, USAMRIID, Extension 7373.

(5) Staff Duty Officer, USAMRIID (after duty hours) Extension 7335.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority. Fire fighters may enter the area after the radiation hazard has been determined. There is little likelihood of radiation hazard unless the temperature of the source shield reaches the melting point of lead (621^{o}F). Water should be sprayed on the source shield if there is any possibility of the temperature approaching this value.

d. Following an emergency the GC-220 shall not be operated until an inspection and a radiation protection survey have been conducted by WRAMC Health Physics.

e. No individual shall undertake repair, perform any maintenance, remove any interlock and/or safety device, or make any changes in and/or on the GC-220 without the knowledge of the Chief, Animal Assessment Division.

f. Under NO circumstances shall explosive material be irradiated in the GC-220.

g. All operators and/or assistants shall wear personnel monitoring devices while working around and/or operating the GC-220 Irradiator.

h. Health Physics, WRAMC, will perform leak tests, periodic inspections and radiation protection surveys.

i. An operating log shall be maintained by the Chief, Animal Assessment Division, USAMRIID.

j. Key control.

(1) Operating keys for the GC-220 and the Gammacell 40, both located in room AA 413, will be kept on a single sealed ring in order to preclude the operation of the GC-220 and the GC-40 simultaneously. Operating keys will be held in room AA 413 under direct supervision of principal investigators approved by the WRAMC Radioisotope Committee.

(2) Duplicate keys for the GC-220 and GC-40 will be secured by the Chief, Animal Assessment Division, USAMRIID.

7. REFERENCES.

a. Atomic Energy of Canada Limited "Operator's Manual for the Gammacell 220 Cobalt 60 Irradiation Unit," edition 7, February 1978.

b. Nuclear Regulatory Commission License.

PETER S. LOIZEAUX
LTC, VC
Chief, Animal Assessment Division

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY MEDICAL RESEARCH INSTITUTE OF INFECTIOUS DISEASES
FORT DETRICK, FREDERICK, MARYLAND 21701

STANDING OPERATING PROCEDURE 13 February 1979

OPERATING AND SAFETY PROCEDURES FOR AECL GAMMACELL 40 IRRADIATOR

1. GENERAL.

a. The Gammacell 40 (GC-40) shall be used (operated) by, or under the supervision of individuals designated by the Walter Reed Army Medical Center (WRAMC) Radiation Control Committee, Deputy Commander, WRAMC, Chairman.

b. The Chief, Animal Assessment Division, USAMRIID is directly responsible for the control and safe use of this irradiator and will designate individuals to operate the GC-40 as approved by the WRAMC Radiation Control Committee.

c. The GC-40 shall be used for medical research and development in radiation biology and radiation dosimetry.

2. DEFINITIONS.

Because the precise meaning given to one or more critical terms frequently determines the interpretation of a statement, the following definitions are given for certain words and phrases as they are used in this document.

a. "Shall" - denotes that the ensuing recommendation is necessary or essential to meet the currently accepted standards of radiation protection.

b. "Should" (is recommended) - indicates advisory recommendations that are to be applied when practicable.

c. "Explosive" - explosives are either solid or liquid, either mixtures or single compounds, and act by explosive chemical reaction, liberating at high speed heat and gas, which causes tremendous pressure.

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d. "Flammable" - materials capable of being easily ignited; preferred to "inflammable", because of possible ambiguity of the in prefix.

e. "Individual" and/or "Operator" - a person designated by the Chief, Animal Assessment Division, USAMRIID, as approved by the WRAMC Radiation Control Committee, to operate the AECL Gammacell 40 Irradiator.

f. "Emergency" - an unforeseen combination of circumstances (e.g., failure of an interlock or safety device, fire, ruptured or leaking source, etc.) that pose a threat to personnel or property by ionizing radiation.

3. RESPONSIBILITIES.

a. The Chief, Animal Assessment Division, USAMRIID:

(1) Ensuring that the GC-40 is operated only by individuals authorized to do so by the WRAMC Radiation Control Committee.

(2) Instruction of individuals in safe operating procedures in accordance with instructions outlined herein. He shall promulgate rules for working safety, including any restrictions of the operating technique known to be necessary.

(3) Ensuring that these instructions and references contained in para 7 are available at the GC-40 unit at all times.

(4) Promptly reporting any source malfunction, accident, or other unplanned occurrence that could result in an unsafe condition or exposure to personnel to the WRAMC Health Physics Officer (6-427-5107).

b. WRAMC Health Physics:

(1) Conducting routine radiation protection surveys and inspections.

(2) Providing personnel dosimetry for all personnel operating the unit.

(3) Instructing operating personnel in the hazards and nature of injuries resulting from overexposure to ionizing radiation.

(4) Providing technical assistance as required.

(5) Providing calibration and routine maintenance services for radiation detection and measuring instruments.

c. Individual operators:

(1) Operating the unit in a safe manner at all times.

(2) Being familiar with the content of these instructions, requirements of the WRAMC authorization, and other regulations as may be prescribed by the Chief, Animal Assessment Division, USAMRIID.

(3) Locking the GC-40 unit and the room upon completion of use.

(4) Ensuring that the keys to the unit and the room door are properly secured to prevent unauthorized use.

(5) Reporting all malfunctions, accidents, and any other unplanned occurrence that could result in an unsafe condition or exposure of personnel promptly to the Chief, Animal Assessment Division, USAMRIID.

4. OPERATING PROCEDURES.

a. Insert key in the keyswitch and turn clockwise to the ON position.

b. Open the sample cavity door by holding in the door lock pushbutton and pulling on the door handle.

c. Remove the sample tray by pushing up from the underside.

d. Place the object to be irradiated in the sample tray and cover with the lid.

e. Replace the sample tray in the sample cavity ring.

f. "Chamber Air" - if ventilation to the sample cavity is required, press the "Chamber Air" button on the control panel which will illuminate white when ventilation air supply is on.

g. Close the sample cavity door and lock making sure it latches.

h. If automatic operation is desired:

(1) Press the Manual/Auto selector switch until the Auto portion of the switch is illuminated.

(2) Set the desired time interval on the timer counter. This is achieved by holding in the red reset button located at the left of the digit windows, and depressing the timer selector buttons until the desired numerals appear. Release the red button.

(3) Press the "Source On" pushbutton, both sources will move to the irradiate position and the timer will start. At the end of the preset time the source drawers will automatically move to their fully whielded safe storage position.

i. If manual operation is desired press the Manual/Auto selector switch until the manual portion of the switch is illuminated, then press the "Source On" pushbutton. The sources will remain in the irradiate position until the "Source Off" switch is operated.

5. SAFETY FEATURES.

Several safety features have been incorporated into the unit for the protection of operating personnel:

a. The source drawers are mechanically interlocked with the sample cavity door to ensure that:

(1) The sample cavity door cannot be opened when the source drawers are in the irradiate position.

(2) The source drawers cannot move into the irradiate position when the sample cavity door is open, or is not completely closed.

b. The mechanical lock on the sample cavity door is electrically interlocked to prevent the door from being opened when either source is not in its fully shielded safe storage position.

c. In the event of a power failure occurring during an irradiation, the source drawers will automatically return to the safe position. After power is restored, the "Source On" pushbutton must be pressed to continue the irradiation.

d. A pressure sensing switch is incorporated in the pneumatic system which will cause the source drawers to return to the safe position if the air pressure drops below 40 psig. Should this situation occur, the Low Air indicator lamp on the control panel will be illuminated.

6. SAFETY PROCEDURES.

a. The GC-40 shall be operated as described in the Atomic Energy of Canada Limited "Instruction Manual Gammacell 40 Caesium 137 Irradiation Unit," edition No. 3, September 1977, and in accordance with this Standard Operating Procedure.

b. In the event of an emergency, malfunction, or other unusual occurrence, the following individuals shall be notified after pressing the "Source Off" switch.

(1) Chief, Animal Assessment Division, USAMRIID, Extension 7244.

(2) Health Physics Officer, WRAMC, Phone 6-427-5107.

(3) Safety Officer, USAMRIID, Extension 7373.

(4) Staff Duty Officer, USAMRIID (after duty hours) Extension 7335.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority.

c. In the event of fire the following individuals shall be notified:

(1) Fire Department, Fort Detrick, Extension 7333.

(2) Chief, Animal Assessment Division, USAMRIID, Extension 7244.

(3) Health Physics Officer, WRAMC, phone 6-427-5107.

(4) Safety Officer, USAMRIID, Extension 7373.

(5) Staff Duty Officer, USAMRIID (after duty hours) Extension 7335.

The senior individual at the site shall clear the area of personnel and restrict access to the area until relieved by competent authority. Fire fighters may enter the area after the radiation hazard has been determined. There is little liklihood of radiation hazard unless the temperature of the source shield reaches the melting point of lead ($621^{o}F$). Water should be sprayed on the source shield if there is any possibility of the temperature approaching this value.

d. Following an emergency the GC-40 shall not be operated until an inspection and a radiation protection survey have been conducted by WRAMC Health Physics.

e. No individual shall undertake repair, perform any maintenance, remove any interlock and/or safety device, or make any changes in and/or on the GC-40 without the knowledge of the Chief, Animal Assessment Division.

f. Under NO circumstances shall explosive material be irradiated in the GC-40.

g. All operators and/or assistants shall wear personnel monitoring devices while working around and/or operating the GC-40 irradiator.

h. Health Physics, WRAMC, will perform leak tests, periodic inspections and radiation protection surveys.

i. An operating log shall be maintained by the Chief, Animal Assessment Division, USAMRIID.

j. Key control.

(1) Operating keys for the GC-220 and the Gammacell 40, both located in room AA 413, will be kept on a single sealed ring in order to preclude the operation of the GC-220 and the GC-40 simultaneously. Operating keys will be held in room AA 413 under direct supervision of principal investigators approved by the WRAMC Radiosiotope Committee.

(2) Duplicate keys for the GC-220 and GC-40 will be secured by the Chief, Animal Assessment Division, USAMRIID.

7. REFERENCES.

a. Atomic Energy of Canada Limited "Instruction Manual Gammacell 40 Caesium 137 Irradiation Unit," edition No. 3, September 1977.

b. Nuclear Regulatory Commission License.

PETER S. LOIZEAUX
LTC, VC
Chief, Animal Assessment Division

DISPOSITION FORM

For use of this form, see AR 340-15, the proponent agency is TAGCEN.

REFERENCE OR OFFICE SYMBOL	SUBJECT
HSWP-QHP	Room AA 413, Bldg 1425, Ft. Detrick, MD

TO Health Physics Office
WRAMC

FROM Special Projects NCO
HPO

DATE 23 Mar 79

CMT 1

SFC Loe/acl/75104

Room AA413, Building 1425, Ft. Detrick, MD, was originally designed as an irradiation suite. Walls and ceiling are constructed of high density concrete of 12" and 16" thickness respectively. The room is bordered on two sides by biological hot suites and on two sides by infrequently used hallways. The room is on ground level (earth below) and the overhead area is a pipe and ventilation crawl space which would be occupied only in case of repairs.

Ronald H Loe

RONALD H. LOE
SFC, USA
Special Projects NCO
Health Physics Office

2 Incl
1. Drawing of Rm AA413
2. Diagram of Ground Floor Bldg 1425

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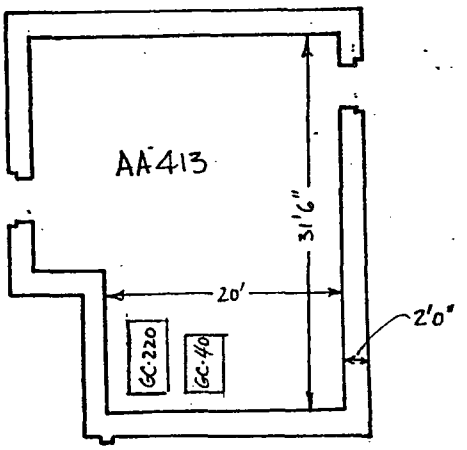
DA FORM 1 FEB 62 2496 REPLACES DD FORM 96, WHICH IS OBSOLETE.

☆ GPO—1975—665-422/1063



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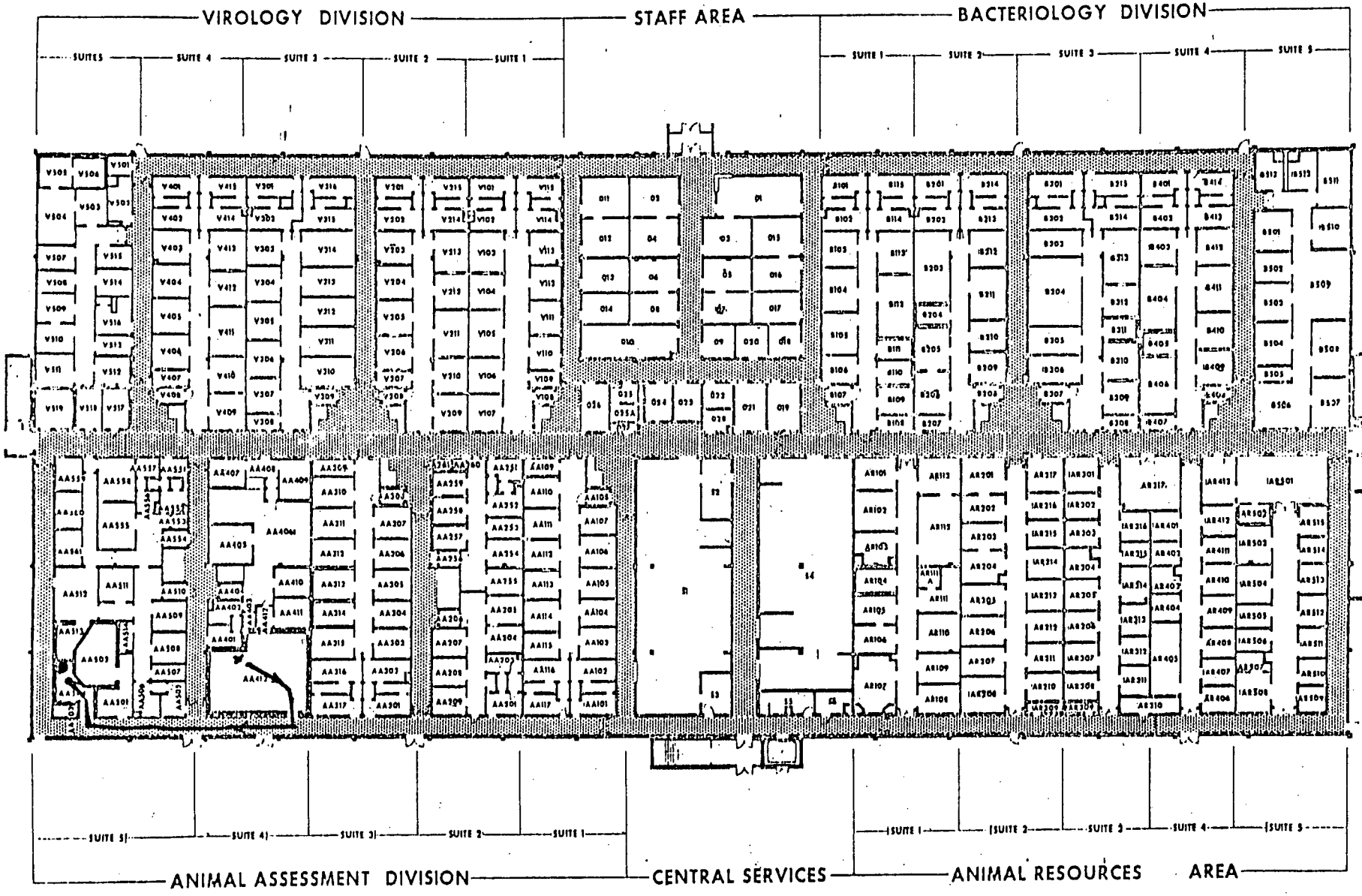

FLOOR PHASE I PLAN

Authorization Letters & Resumes
for J.N. Thurley & W.C. Doherty

Atomic Energy of Canada Limited
L'Énergie Atomique du Canada, Limitée

Commercial Products
Produits Commerciaux

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Tel. (613) 592-2790
Telex. 053-4162

TO WHOM IT MAY CONCERN

Atomic Energy of Canada Limited, Commercial Products, (AECL-CP), a Crown Corporation being for all its purposes an agent of Her Majesty the Queen in Right of Canada, hereby designates W.C. DOHERTY as an accredited Technician acting on behalf of the Corporation in all work areas associated with field operations on AECL-CP standard products. W.C. DOHERTY is qualified to cope with the following specialized tasks:

(a) installation of equipment(s) and its radioactive contents,
(b) removal of equipment(s) and its radioactive contents,
(c) servicing equipment(s) and manipulation of its radioactive contents,
(d) refurbishing and testing radiation equipment(s),
(e) transfer of radioactive materials,
(f) replenishment and removal of radioactive materials,
(g) contamination detection and decontamination procedures,
(h) radiation surveys with approved instrumentation,
(j) emergency procedures to be adopted in the event of an incident, and
(k) preparation of equipment(s) and radioactive source(s) for on-going shipment.

This is to certify that W.C. DOHERTY has received in-house training in applied:

(l) principles and practices of radiation protection,
(m) radioactivity measurement standardization and monitoring techniques and instruments,
(n) mathematics and calculations basic to the use and measurement of radioactivity, and
(o) biological effects of radiation.

FOR: Atomic Energy of Canada Limited, Commercial Products.

BY: ..... F.M. Fraser

TITLE: Industrial Products

DATE: 26-5-76

BY: ..... E.F. Ridout

TITLE: Product Licensing Officer, Product Quality Assurance.

DATE: 26 May, 1976

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5/76

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TO WHOM IT MAY CONCERN

Atomic Energy of Canada Limited, Commercial Products, (AECL-CP), a Crown Corporation being for all its purposes an agent of Her Majesty the Queen in Right of Canada, hereby designates .....A.N. THURLEY..... as an accredited Technician acting on behalf of the Corporation in all work areas associated with field operations on AECL-CP standard products. .....A.N. THURLEY..... is qualified to cope with the following specialized tasks:

(a) installation of equipment(s) and its radioactive contents,
(b) removal of equipment(s) and its radioactive contents,
(c) servicing equipment(s) and manipulation of its radioactive contents,
(d) refurbishing and testing radiation equipment(s),
(e) transfer of radioactive materials,
(f) replenishment and removal of radioactive materials,
(g) contamination detection and decontamination procedures,
(h) radiation surveys with approved instrumentation,
(j) emergency procedures to be adopted in the event of an incident, and
(k) preparation of equipment(s) and radioactive source(s) for on-going shipment.

This is to certify that .....A.N. THURLEY..... has received in-house training in applied:

(l) principles and practices of radiation protection,
(m) radioactivity measurement standardization and monitoring techniques and instruments,
(n) mathematics and calculations basic to the use and measurement of radioactivity, and
(o) biological effects of radiation.

FOR: Atomic Energy of Canada Limited, Commercial Products.

BY: ..... F.M. Fraser
TITLE: Industrial Products
DATE: 26.5.76

BY: ..... E.F. Ridout
TITLE: Product Licensing Officer, Product Quality Assurance.
DATE: 26 May 1976

Q2.3.2
5/76

RESUME

NAME: Wayne Clayton Doherty

EDUCATION: Secondary School Graduation Grade 13
MacKenzie High School, Deep River, Ontario

Two years of 3 year course in Chemical Engineering Technology
Eastern Ontario Institute of Technology

EMPLOYMENT: 1964 - 6 months as student Atomic Energy of Canada,
Chalk River, Ontario - as Reactor Operations Technician

April 1966 - October 1967 - Bell Telephone Company of Canada
as Control Office Technician

October 1967 - present - Atomic Energy of Canada Limited,
Commercial Products.

FIELD WORK: 1967 - 72 - Physics technician operating a research pool facility containing up to 150,000 curies Cobalt 60. Responsible for maintaining interlocks and source handling.

1972 - present - Employed as installation and service technician for industrial products group. Assist in the installation of several large irradiator sources.

1974 - Modification and source replenishment to Becton, Dickinson, Canaan, Connecticut medical products irradiator - approximately 150,000 curies Cobalt 60.

1975 - Modification and source replenishment to Johnson & Johnson, San Angelo, Texas - approximately 250,000 curies Cobalt 60

1976 - Modification and source replenishment to Toronto Sterilized Products, Toronto, Ontario - approximately 250,000 curies Cobalt 60.

Over the past five years have installed numerous Gammacell 40's, 220's, 200's and Gammabeam 150's and specialized self contained irradiators such as RAI, Long Island, New York and Gammabeam 650, Raychem Corp., Red Wood City, California.

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ON THE JOB TRAINING:

(a) Radiation training course, Chalk River Nuclear Labs

(b) Principles and practices of radiation protection

(c) Radioactivity measurements standards and monitoring technique and instruments

(d) mathematics and calculation to the use and measurement of radioactivity

(e) in house course on biological effects of radiation.

February 7, 1978.

QUALIFICATIONS & EXPERIENCE

INSTALLATION & SERVICE CO-ORDINATOR

RESEARCH AND INDUSTRIAL IRRADIATORS

FULL NAME: Albert N. Thurley

ACADEMIC QUALIFICATIONS:

Ottawa Technical High School,
(Honors graduate - Grade XII)

Eastern Ontario Institute of Technology,
(First year)

EMPLOYMENT WITH AECL:

15 years

TRAINING:

On-the-job training in:

(a) Principles and practices of radiation protection (AECL)

(b) Radioactivity measurement standardization and monitoring techniques and instruments (AECL), and

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

AECL in-house courses on biological effects of radiation.

FIELD INSTALLATION, SERVICING, SOURCE REPLENISHMENTS AND CELL OPERATIONS ON AECL EQUIPMENTS

1. (a) Assisted licensed installer with underwater load/unload operations between shipping flasks and wet storage pool. AECL facility (March 1975) - total content 200,000 Ci Cobalt 60.

(b) Assisted licensed installer with load/unload operations between wet storage pool and shipping flask, Hawaii Development Irradiator (January 1978) - total content 57,000 Ci Cobalt 60.

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c) Assisted licensed installer with load/unload operations between shipping flask and wet storage pool, University of Hawaii Research Irradiator (January 1978) total content 40,000 Ci Cobalt 60.

d) Assisted in the installation of product irradiator at Convertors, El Paso, Texas (Sept. - Oct. 77) total content 2,000,000 Ci Cobalt 60.

e) Assisted in the installation of IR-97 (Special) Product Irradiator at Isomecix, South Carolina - June, July and August 1978.

f) Assisted in the installation of JS7500 Product Irradiator at Arbrook, Scotland - November 1978.

g) Assisted in the installation of JS7400 Product Irradiator for USDA, in Tapachula, Mexico. December 1978 & January 1979. Total content 33,000 Ci cobalt-60.

3. Assisted licensed installer with Gammacell 200 installation in Binghampton, New York (April 1975) - total content 9,000 Ci Cobalt 60.

4. Assisted licensed installer with Gammacell 220 removal at Fort Worth, Texas (March 1975) - total content 9,000 Ci Cobalt 60.

5. Six months experience as a technician carrying out cell decontamination operations (AECL facility).

6. Presently with AECL Industrial Products Group, involved in the design and on-going development of research irradiators.

7. Has been involved with servicing Research Irradiators in Canada.

8. Installed Gammacell 220 at the University of California, Los Angeles, California (November 1975) - total content 24,000 Ci cobalt-60.

9. Installed Gammacell 220 at RCA Solid State, Somerville, N.J. February 1976 - total content 24,000 Ci Cobalt 60.

10. Removed GC-220 from Fitzimons General Hospital, Denver, Colorado and reinstalled the unit at VA Hospital, Denver, Colorado (April 1976) - total content 12, Ci Cobalt 60.

11. Removed and reinstalled GC-220 at Bell Telephone Laboratories, Murray Hill, N.J. (Feb. 1976) - total content 12,000 Ci Cobalt 60.

12. Installed GC-220, RCA Corp., Findlay, Ohio (November 1976).

13. Moved GC-220 at the University of Akron, Akron, Ohio (November 1976) total content 8,000 Ci Cobalt 60.

14. Additional GC-220 installations in Brazil, Venezuela and Canada.

15. Installed Gammacell 40 at Bollweevil Research Laboratory, Mississippi, State University, Mississippi (June 1977) total content 3,600 Ci Caesium 137.

16. Installed Gammacell 40 at East Carolina University, North Carolina (July 1977) - total content 3,600 Ci Caesium 137.

17. Moved Gammacell 40 at Scripps Clinic & Research Laboratories, La Jolla, California (September 1976) - total content 3,600 Ci Caesium 137.

18. Installed Gammacell 40 at Schering Corporation, Bloomfield, N.J. (September 1977) - total content 3,600 Ci Caesium 137.

19. Additional GC40 installations in Canada and Japan.

20. Removed and reinstalled Gammabeam 150 at Salk Institute, La Jolla, California (June 1977) - total content 6,000 Ci Cobalt 60.

21. Additional GB-150 installations in Munich, Germany and Halifax, Nova Scotia.

NRC-374C
6-75

U. S. NUCLEAR REGULATORY COMMISSION

Page 1 of 1 Pages

MATERIALS LICENSE

Supplementary Sheet

License Number 54-00300-12

This Copy Is For Your Files

Docket or Reference No.

Amendment No. 05

Atomic Energy of Canada Limited
Commercial Products
Industrial Products Division
P. O. Box 6300, Station J
Ottawa, Ontario, Canada K2A 3W3

In accordance with application dated December 1, 1976, License Number 54-00300-12 is amended as follows:

Subitems 6.C., 7.C., and 8.C. are amended to read:

Byproduct, source, and/or special nuclear material	7. Chemical and/or physical form	8. Maximum amount that licensee may possess at any one time under this license
C. Cobalt 60	C. Sealed sources (AECL)	C. 50,000 curies

For the U. S. Nuclear Regulatory Commission

Nathan Baasim

by Radioisotopes Licensing Branch

Division of Materials and Fuel Cycle
Facility Licensing
Washington, D. C. 20555

Date MAR 2 1977

FORM NRC-374A
(5-76)

U. S. NUCLEAR REGULATORY COMMISSION

MATERIALS LICENSE

Supplementary Sheet

License Number 54-00300-12

Docket or
Reference No.

Amendment No. 04

Atomic Energy of Canada Limited
Commercial Products
Industrial Products Division
P. O. Box 6300, Station J
Ottawa, Ontario, Canada K2A 3W3

In accordance with letter dated September 7, 1976, License Number 54-00300-12 is amended as follows:

Condition 12. is amended to read:

12. Licensed material shall be used by, or under the supervision and in the physical presence of, A. T. L. Ashfield, H. M. F. Warland, F. L. Fraser, Ian L. T. Conn, Richard G. McKinnon, Eric K. Curnow, J. deLind Van Wijngaarden, W. C. Doherty, William Richard Green, E. F. Ridout, Albert N. Thurley, Roderick Dit Hing Chu, Barrie John Jackson, Albert O'Connor Leduc, Leonard Garry Leeson, Jiri Kotler, or Stefan A. Jaeger.

Date

For the U. S. Nuclear Regulatory Commission

by Radioisotopes Licensing Branch

Division of Fuel Cycle and
Material Safety
Washington, D.C. 20555

NRC MEC-374
(1976)
10 CFR 30

U. S. ATOMIC ENERGY COMMISSION
BYPRODUCT MATERIAL LICENSE

Pursuant to the Atomic Energy Act of 1954 and Title 10, Code of Federal Regulations, Chapter 1, Parts 30, 32, 33, 34, and 35, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, own, possess, transfer and import byproduct material listed below; and to use such byproduct material for the purpose(s) and at the place(s) designated below. This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Atomic Energy Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Atomic Energy of Canada Limited Commercial Products Industrial Products Division 2. P. O. Box 6300, Station J Ottawa, Ontario, Canada K2A 3W3	3. License number 54-00300-12 4. Expiration date August 31, 1979 5. Reference No.

6. Byproduct material (element and mass number)	7. Chemical and/or physical form	8. Maximum amount of radioactivity which licensee may possess at any one time
A. Cobalt 60	A. Sealed sources (AECL)	A. 26,000 curies
B. Cobalt 60	B. Sealed sources (AECL)	B. 6,000 curies
C. Cobalt 60	C. Sealed sources (AECL)	C. 30,000 curies
D. Cesium 137	D. Sealed sources (AECL Model C-161, Type 8)	D. 4,200 curies

9. Authorized use

A. To be used in Atomic Energy of Canada, Ltd., Gammacell Irradiator Models 100, 200, and 220 as necessary to the installation and servicing of the Gammacell irradiators at the site of customers who possess an appropriate U. S. Atomic Energy Commission license. (See Condition 14)

B. To be used in Atomic Energy of Canada Limited Gammabeam 150 irradiators as necessary to the installation and servicing of Gammabeam 150's at the site of customers who possess an appropriate U. S. Atomic Energy Commission license. (See Condition No. 15).

C. To be used in Atomic Energy of Canada Limited Gammabeam 650 (Type IR23) irradiators as necessary to the installation and servicing of Gammabeam 650's at the site of customers who possess an appropriate U. S. Atomic Energy Commission license. (See Condition 16).

9. Authorized use continued

D. To be used in Atomic Energy of Canada Limited Gammacell Model 40 irradiators and shipping containers as necessary to the installation and servicing of Gammacell 40 irradiators at the site of customers who possess an appropriate U. S. Atomic Energy Commission license. (See Condition 17).

CONDITIONS

10. Byproduct material shall be used only at temporary job sites of the licensee anywhere in the United States where the U. S. Atomic Energy Commission maintains jurisdiction for regulating the use of byproduct material.

11. The licensee shall comply with the provisions of Title 10, Chapter 1, Code of Federal Regulations, Part 19, "Notices, Instructions and Reports to Workers; Inspections" and Part 20, "Standards for Protection Against Radiation."

12. Byproduct material shall be used by, or under the supervision and in the physical presence of, A. T. L. Ashfield, H. M. F. Warland, F. L. Fraser, Ian L. T. Conn, Richard G. McKinnon, Eric K. Curnow, J. deLind Van Wijngaarden, W. C. Doherty, Sidney E. Payne, or E. F. Ridout.

13. The licensee is hereby authorized to perform leak tests on the sealed sources licensed in Items 6, 7, and 8 during installation or servicing of the irradiators as authorized in Item 9. The leak tests shall be in accordance with the leak test condition on the customer's license. Such a test will satisfy the leak test requirements of the customer's license, provided that the customer is supplied the results of the leak test in microcuries and advised of the requirements for removing from service the device containing the sealed sources and reporting the results to the U. S. Atomic Energy Commission if the leak test reveals contamination in excess of that specified by his license.

14. The activities authorized in Subitem 9.A. shall be conducted in accordance with the installation procedures described in AECL manuals entitled, "Instruction Manual, Gammacell 100 and 200" submitted with letter dated July 13, 1962, "Instruction Manual, Gammacell 200," submitted with letter dated December 1, 1964, and "Instruction Manual, Gammacell 220," submitted with letter dated July 16, 1960.

CONDITIONS

(Continued)

15. This license permits the licensee to conduct only those activities authorized in Subitem 9.B. that are specified in "INSTALLATION PROCEDURE FOR GAMMABEAM 150 IRRADIATORS" attached to application dated March 18, 1964. The foregoing procedures shall be amended to add a sentance at the end of the last paragraph under the section entitled "Assembly" as follows:

CAUTION: The irradiator room is not to be occupied during operational testing of the "up travel limit microswitch" or at any time when the source is in the "on" (unshielded) condition.

16. The activities authorized in Subitem 9.C. shall be conducted in accordance with the procedures described in "Installation Procedure for Gammabeam 650 (Type IR23) Irradiator", submitted with letter dated May 2, 1967. These procedures shall be amended to include that all personnel involved in such operations will wear film badges and pocket dosimeters. At least one alarm-type radiation monitor and one high range, non-blocking survey meter shall be present.

The activities authorized in Subitem 9.D. shall be conducted in accordance with the procedures described in "Gammacell 40 - Unit and Source Installation Instruction", submitted with letter dated March 31, 1971.

For the U. S. Atomic Energy Commission
Original signed by
FRANK C. DAVIS
by Materials Branch
Directorate of Licensing
Washington, D. C. 20545

Date August 23, 1974

EXPIRES - APRIL-30-1979

DEPARTMENT OF TRANSPORTATION
MATERIALS TRANSPORTATION BUREAU
WASHINGTON, D C 20590

IAEA CERTIFICATE OF COMPETENT AUTHORITY

Type B Radioactive Material Package Design

(Revision 2)

Certificate Number USA/6355/B

(Revalidation of Canadian Certificate CDN/2009/B(U))

This establishes that the packaging design described herein, when loaded with the authorized radioactive contents, has been certified on March 8, 1976, by the National Competent Authority of Canada (Appendix A), as meeting the regulatory requirements for Type B packaging for radioactive materials as prescribed in IAEA[1]/ Regulations and constitutes a revalidation of that certificate in accordance with §§ 49 CFR 173.393b, 173.395(b)(3); 46 CFR 146.19-100; and 14 CFR 103 of the USA[2]/ [3]/ [4]/ Regulations for the transport of radioactive materials.

I. Package Identification - F-147 Transfer Case.

II. Packaging Description - Packaging authorized by Canadian Certificate CDN/2009/B(U) consists of a lead-shielded steel inner container within a steel encased wooden outer container 34 inch by 40 inch by 42 inch weighing about 3900 pounds.

III. Authorized Radioactive Contents - The authorized contents consist of radioactive materials n.o.s. as not more than 15,000 curies of cobalt-60 encapsulated in stainless steel, or not more than 8,000 curies of cesium-137 as chloride encapsulated in stainless steel.

IV. General Conditions -

a. Each user of this certificate must have in his possession a copy of this certificate.

b. Each user of this certificate, other than Atomic Energy of Canada, Limited, Ottawa, Canada, shall register his identity in writing to the Office of Hazardous Materials Operations, U.S. Department of Transportation, Washington, D.C. 20590.

c. This certificate does not relieve any consignor or carrier from compliance with any requirement of the Government of any country through or into which the package is to be transported.

V. Marking and Labeling - In addition to the markings prescribed in Canadian Certificate CDN/2009/B(U), the package must also bear the marking USA/6355/B, as well as the other marking and labels prescribed by the USA Regulations.

VI. Expiration Date - This certificate, unless renewed, expires on April 30, 1979.

This revision is issued in accordance with the requirements of the IAEA and USA Regulations and in response to the September 22, 1976 petition by Atomic Energy of Canada, Ltd, Ottawa, Canada, and in consideration of the associated information provided in Canadian Certificate CDN/2009/B(U) (Appendix A).

Certified by:

A. W. Grella October 13, 1976
A. W. Grella (DATE)
Chief, Technology Division
Office of Hazardous Materials Operations
U.S. Department of Transportation

1/ "Safety Series No. 6, Regulations for the Safe Transport of Radioactive Materials, 1967 Edition," published by the International Atomic Energy Agency (IAEA), Vienna, Austria.

2/ Title 49, Code of Federal Regulations, Parts 100-199, USA.

3/ Title 46, Code of Federal Regulations, Part 146, USA.

4/ Title 14, Code of Federal Regulations, Part 103, USA.

This certificate supersedes in its entirety, DOT Special Permit 6355, with respect to international shipments.

Revision 1 issued to incorporate Canadian Certificate CDN/2009/B(U) and to revise expiration date.

Revision 2 issued to revise authorized contents.

Atomic Energy Control Board
Commission de contrôle de l'énergie atomique

P.O. Box 1046
Ottawa, Canada
K1P 5S9

C.P. 1046
Ottawa, Canada
K1P 5S9

Our file / Notre référence 30-A2-89

8 March 1976

RADIOACTIVE MATERIAL TYPE B(U) PACKAGE DESIGN AND SHIPMENT CERTIFICATE CDN/2009/B(U)T REVISION 0

This certifies that the packaging, as described, when loaded with the authorized radioactive contents and prepared for shipment in accordance with the instructions described below; has been demonstrated to meet the regulatory requirements prescribed for package design and shipment of Type B Unilateral packages as described in the IAEA (1) and Canadian regulations (2)(3)(4)(5) as appropriate, for the transportation of radioactive material.

Each shipper under this authorization, other than the original applicant, shall register his identity with the Atomic Energy Control Board prior to his first use of this authorization and shall certify that he possesses the necessary instructions for preparation of the package for shipment.

This Certificate does not relieve the shipper and carrier from compliance with any requirement of the government of any country through or into which the package will be transported.

PACKAGING DESCRIPTION

F-147 Transfer Case as shown on Atomic Energy of Canada Limited - Commercial Products drawing TC-3-1 (latest AECB approved revision); having a lead-shielded (250 mm) steel-encased inner container containing the authorized capsule, within a 90 mm thick steel-encased wood outer impact and fire shield having external dimensions of 850 mm by 1020 mm by 1070 mm high. The containment system consists of the authorized capsule(s) and the steel-encased lead-shielded container. The total weight is 1770 kg. These packagings shall bear the competent authority identification mark "CDN/2009/B(U)" or "CDN-U9".

AUTHORIZED RADIOACTIVE CONTENTS

Not more than 15,000 curies of cobalt-60 metal doubly encapsulated in C-146 and C-151 welded type 316L stainless steel capsules or in non-AECL capsules which meet Special Form requirements. The decay heat output from this material is not greater than 250 W. Surface heat flux is not greater than $60 W/m^2$,

or;

not more than 8000 curies of cesium-137 as "normal form" cesium chloride pellets doubly encapsulated within C-161 welded stainless steel capsule assemblies Type 1 to 8. The decay heat output from this material is not greater than 40W.

99630

(III)

SHIPMENT

For the purposes of design, the ambient temperature has been assumed as 38°C and the insolation as stated in Table III of (1).

The package shall be prepared for shipment in accordance with the approved procedure on the above-noted file and shall be further prepared for shipment and shipped and carried in accordance with the most recent Canadian Regulations for road(2), rail(3), marine(4), and air(5) transport and with the international regulations (1). Supplementary instructions re heat distribution are required. This certificate authorizes shipment by road, rail, marine and air transport.

This Certificate is issued in accordance with IAEA Regulations (1), the Atomic Energy Control Regulations(2), and by agreement with Canadian transportation regulatory authorities.

EXPIRY DATE

This Certificate expires 30 April 1979.

Certified by:

Endorsed by:

J. H. Dennekens
Director - Directorate of Licensing
Atomic Energy Control Board
P.O. Box 1046
Ottawa, CANADA
(Acting competent authority for road transport)

E. J. Hase
Director of Operation
Railway Transport Committee
Canadian Transport Commission
Ottawa, CANADA

R. L. Bolduc, Director
Director, Aeronautical Licensing and Inspection Branch,
Civil Aviation Branch
Department of Transport
Ottawa, CANADA

G. W. Graves - Chairman
Board of Steamsnip Inspection
Marine Regulations Branch
Ministry of Transport
Ottawa, CANADA

REFERENCES

(1) IAEA "Regulations for the Safe Transport of Radioactive Materials", 1973 Edition Safety Series No. 6, International Atomic Energy Agency, Vienna STI/PUB/323.

(2) Atomic Energy Control Regulations, SOR/74-334 dated 4 June 1974.

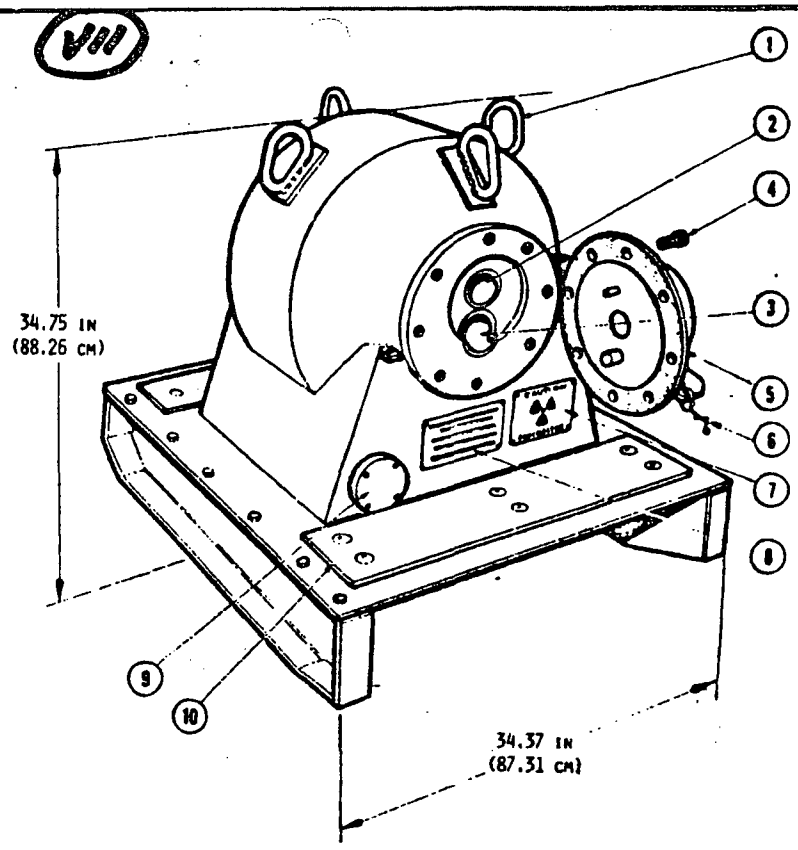
(3) Regulations for the Transportation of Dangerous Commodities by Rail, as issued by the Canadian Transport Commission.

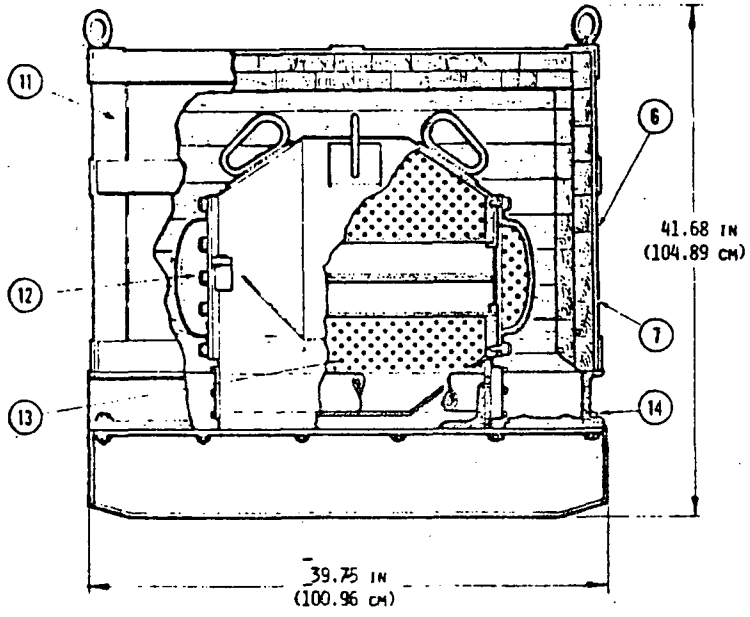
(4) IMCO "International Dangerous Goods Code" published by the Inter-Governmental Maritime Consultative Organization, London. Authorized under Canada Shipping Act, Dangerous Goods Shipping Regulations SOR/73-327 d 14 June 1973. Refer also to National Harbours Board and St. Lawrence Seaway Authority regulations as appropriate.

(5) IATA "Restricted Articles Regulations". Radioactive materials packaged and shipped in accordance with Part 2 of these regulations are deemed to meet the requirements of Sec 800 of the Air Regulations for Canada. See Flight Information Manual 1975 (T53-5/1975).

PARTS LIST

1. LIFTING HANDLES (4)
2. SOURCE DRAWER
3. DUMMY DRAWER
4. DOOR BOLTS - 5/8 IN-11 x 11N LG - SOCKET HD (16)
5. GASKET - NEOPRENE (2)
6. WIRE SEALS (2)
7. RADIATION CAUTION PLATES (4)
   AECL SPEC. NO. DG0096
8. AECB CERTIFICATION PLATE (4)
   AECL SPEC. NO. DG0097
9. SPARE DUMMY DRAWER
10. FIREPROOF TRANSITE (2)
11. FIRESHIELD - STEEL FRAME - SHEET METAL - CEDAR
12. DOOR - LEAD SHIELDED
13. LEAD SHIELDING
14. FIRESHIELD BOLTS - 0.5 IN-13 x 2.5 IN LG HEX HD (12)





NOTES

1. AECB CERTIFICATE CDN/2009/B(U)
2. CONFORMS IN ALL RESPECTS TO IAEA TYPE B(U) PACKAGING AS SPECIFIED IN "REGULATIONS FOR THE SAFE TRANSPORT OF RADIOACTIVE MATERIALS, 1973 EDITION, SAFETY SERIES NO. 6 AND AECL SPEC NO. DG0086
3. LEAD SHIELDING 9 IN (22.9 CM)
4. FLOOR LOADING BASED ON PROJECTED FLOOR AREA 435 LB/SQ FT (0.21 KG/SQ CM).
5. APPROVED CONTENTS - 15,000 CURIES COBALT 60
   - 8,000 CURIES CESIUM 137
6. TOTAL WEIGHT - 3900 LBS (1770 KG).

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
P.O. BOX 6300 POSTAL STATION J K2A 3W3 OTTAWA

TITLE
STANDARD ROUND DRAWER TRANSFER CASE WITH FIRESHIELD

REF. DWG. TC-3-1 & D93-V-1			REVISED 5 MAY 1975	
DATE 11 JULY 1967			No. F-147	REV. D
DRAWN	CHECKED	APPROVED	SHEET 1 OF 1	

1. Check that any required drawer end blocks are in place.

2. Check that the neoprene gaskets on the doors of the containers are in good condition.

3. Torque all door closure bolts to 80 ft lb (11 kg m).

NOTE:

HIGH TENSILE BOLTS (180,000 psi) MUST BE USED FOR ALL DOOR CLOSURE BOLTS.

4. Apply wire-lead seal through the holes in the heads of at least two of the door closure bolts or through each door latch.

5. Install fireshield and fasten all fireshield bolts. Torque all bolts to 30 ft lb (4.2 kg m). Use SAE Grade 2 bolts, minimum tensile strength 74,000 psi or better.

6. Reference Drawings:

F-131 - AO5818		F-147 - TC-3-1, D93-V-1	
F-143 - TC-1-1, TC-1-38		F-158 - AO6414	

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
P.O. BOX 6300, Postal Station J, OTTAWA, CANADA. K2A 3W3

TITLE PREPARATION FOR SHIPMENT
F-131, F-143, F-147 AND F-158 CONTAINERS

REF. DWG. See Item 6

DATE June 1978

DRAWN | CHECKED | APPROVED

REVISED No. DS-0486 REV

SHEET 1 OF 1

DEPARTMENT OF TRANSPORTATION
RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION
WASHINGTON, D.C. 20590

IAEA CERTIFICATE OF COMPETENT AUTHORITY

Type B Radioactive Material Package Design

REFER TO:

Certificate Number USA/6125/B(U)
(Revalidation of Canadian Certificate CDN/2013/B(U)T, Rev. 0)
(Revision 1)

This establishes that the packaging design described herein, when loaded with the authorized radioactive contents, has been certified on February 3, 1976, by the National Competent Authority of Canada (Appendix A) as meeting the regulatory requirements for Type B packaging for radioactive materials as prescribed in IAEA[1] Regulations and constitutes a revalidation of that certificate in accordance with §§ 49 CFR 173.393b, 173.394(c)(3) and 173.395(c)(3) of the USA[2] Regulations for the transport of radioactive materials.

I. Package Identification - AECL Gammacell 220.

II. Packaging Description - Packaging authorized by this certificate consists of a lead-shielded, thermally insulated steel body within a plywood shiping case 67" by 62" by 42" weighing approximately 8,500 pounds.

III. Authorized Radioactive Contents - The authorized contents consist of not more than 26,000 curies of cobalt-60 doubly encapsulated in stainless steel or aluminum and stainless steel.

IV. General Conditions -

a. Each user of this certificate must have in his possession a copy of this certificate.

b. Each user of this certificate, other than Atomic Energy of Canada Ltd, Ottawa, Canada, shall register his identity in writing to the Office of Hazardous Materials Regulations, U. S. Department of Transportation, Washington, D. C. 20590.

c. This certificate does not relieve any consignor or carrier from compliance with any requirement of the Government of any country through or into which the package is to be transported.

V. Marking and Labeling - In addition to the marking prescribed in Canadian Certificate CDN/2013/B(U)T, the package must also bear the marking USA/6125/B(U), as well as the other marking and labels prescribed by the USA Regulations.

VI. Expiration Date - This certificate, unless renewed, expires on March 30, 1979.

Encl 9

This certificate is issued in accordance with the requirements of the IAEA and USA Regulations and in response to the February 24, 1975 petition by Atomic Energy of Canada, Ltd, Ottawa, Canada, and in consideration of the associated information provided in Canadian Certificate CDN/2013/B(U), Rev. 0. (Appendix A).

Revision 1 issued in response to the May 3, 1978 petition by G. E. Dillingham, Ogdensburg, N. Y.

Certified by:

A. W. Grella
Chief, R & D Management Division
Office of Program Support
Materials Transportation Bureau

June 1, 1978
(DATE)

[1]"Safety Series No. 6, Regulations for the Safe Transport of Radioactive Materials," 1967 Edition pubished by the International Atomic Energy Agency (IAEA), Vienna, Austria.

[2]Title 49, Code of Federal Regulations, Parts 100-199, USA.

This certificate supersedes in its entirety, DOT Special Permit 6125.

Revision 1 issued to incorporate Canadian Certificate CDN/2013/B(U)T and to extend expiration date.

Atomic Energy Control Board
Commission de contrôle de l'énergie atomique

P.O. Box 1046
Ottawa, Canada
K1P 5S9

C.P. 1046
Ottawa, Canada
K1P 5S9

Our file Notre référence 30-A2-93

3 February 1976

RADIOACTIVE MATERIAL TYPE B(U) PACKAGE DESIGN AND SHIPMENT CERTIFICATE CDN/2013/B(U)T REVISION 0

This certifies that the packaging, as described, when loaded with the authorized radioactive contents and prepared for shipment in accordance with the instructions described below, has been demonstrated to meet the regulatory requirements prescribed for Type B(U) packages and shipment as described in IAEA (1) and Canadian regulations (2)(3)(4)(5) as appropriate, for the transportation of radioactive material.

Each shipper under this authorization, other than the original applicant, shall register his identity with the Atomic Energy Control Board prior to his first use of this authorization and shall certify that he possesses the necessary instructions for preparation of the package for shipment.

This Certificate does not relieve the shipper and carrier from compliance with any requirement of the government of any country through or into which the package will be transported.

PACKAGING DESCRIPTION

Gammacell 220 Irradiator prepared for shipment as illustrated on Atomic Energy of Canada Limited, Commercial Products, drawing A01885, (latest AECB approved revision) having a lead-shielded 760 mm diameter steel-encased body, which with the capsule assemblies is the containment system, completely wrapped in thermal insulation within a partial sheet metal cabinet, within a plywood shipping case. The plywood case has external dimensions of 1700 mm high by 1070 mm wide by 1560 mm long, and a total weight of 3800 kg. This package shall bear the competent authority identification mark "CDN/2013/B(U)".

AUTHORIZED RADIOACTIVE CONTENTS

Not more than 26,000 curies of ^{60}Co in the form of metal pellets or slugs. Pellets and unsheathed slugs are doubly encapsulated in C198 stainless steel capsule assemblies. The aluminum-sheathed slugs are singly encapsulated in C185 stainless steel capsule assemblies. All capsules are mounted in a cylindrical source cage. The decay heat output for this material is not greater than 350 W. Maximum surface heat flux is 32 W/m^2.

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SHIPMENT

For the purposes of design the ambient temperature has been assumed as 38°C and the insolation as stated in Table III of (1).

The package shall be prepared for shipment in accordance with the approved procedures on the above-noted file and shall be further prepared for shipment and shipped and carried in accordance with the most recent Canadian Regulations for road (2), rail (3) marine (4) and air (5) transport and with the international regulations (1). Stowage instructions regarding heat removal shall be provided by the shipper. This certificate authorizes shipment by road, rail, marine and air transport. (Cargo aircraft only)

This Certificate is issued in accordance with the IAEA Regulations (1), the Atomic Energy Control Regulations (2), and by agreement with Canadian transportation regulatory authorities.

EXPIRY DATE

This certificate expires 30 March 1979.

Certified by: (5) Endorsed by:

for J. H. Jennekens
Director - Directorate of Licensing
Atomic Energy Control Board
P.O. Box 1046
Ottawa, CANADA
(Acting competent authority for road transport)

E. J. Hase
Director of Operation
Railway Transport Committee
Canadian Transport Commission
Ottawa, CANADA

R. L. Bolduc, Director
Director, Aeronautical Licensing and Inspection Branch,
Civil Aviation Branch
Department of Transport
Ottawa, CANADA

G. W. Graves - Chairman
Board of Steamsnip Inspection
Marine Regulations Branch
Ministry of Transport
Ottawa, CANADA

REFERENCES

(1) IAEA "Regulations for the Safe Transport of Radioactive Materials" 1973 Edition Safety Series No. 6, International Atomic Energy Agency, Vienna STI/PUB/323.

(2) Atomic Energy Control Regulations, SOR/74-334 dated 4 June 1974.

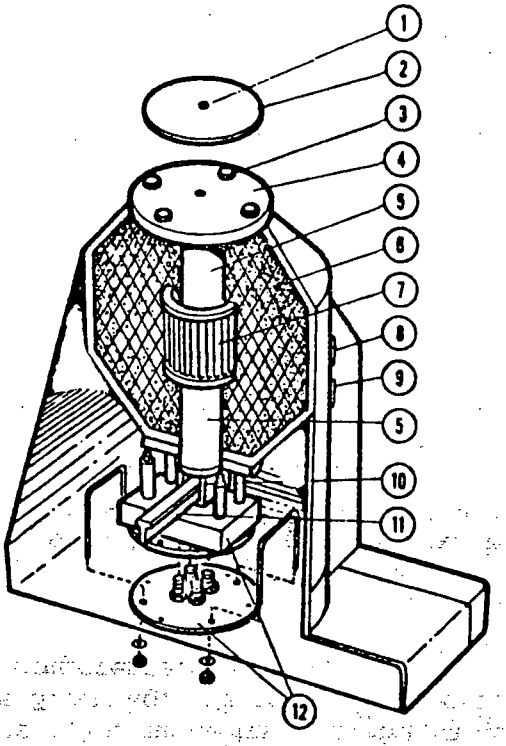
(3) Regulations for the Transportation of Dangerous Commodities by Rail, as issued by the Canadian Transport Commission.

(4) IMCO "International Dangerous Goods Code" published by the Inter-Governmental Maritime Consultative Organization, London. Authorized under Canada Shipping Act, Dangerous Goods Shipping Regulations SOR/73-327 d 14 June 1973. Refer also to National Harbours Board and St. Lawrence Seaway Authority regulations as appropriate.

(5) IATA "Restricted Articles Regulations". Radioactive materials packaged and shipped in accordance with Part 2 of these regulations are deemed to meet the requirements of Sec 860 of the Air Regulations for Canada. See Flight Information Manual 1975 (T53-5/1975).

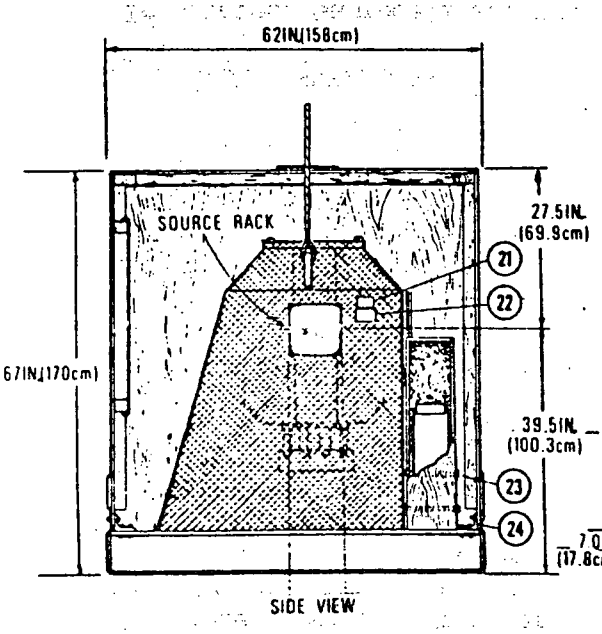
PACKAGE DESCRIPTION

1. 3/8 IN. x 16 BOLT (1)
2. 0.5 IN. (1.27 CM) THICK LEAD SHIELDING PLATE
3. 3/4 IN-10 x 2-1/2 IN. LG SOCKET HEAD SCREWS (4)
4. SHIPPING COVER - STEEL PLATE 1 IN. (2.54 CM) THICK
5. LOWER DRAWER
6. LEAD SHIELDING
7. STAINLESS STEEL SOURCE RACK 8.8 IN DIA (22.3 CM) x 8.3 IN. (21 CM) WITH STAINLESS STEEL WELDED CAPSULES CONTAINING COBALT 60
8. RADIATION CAUTION PLATE WITH SPECIFIED CONTENT (1) - AECL CP SPEC DG0095
9. AECB CERTIFICATION PLATE (1) - AECL CP SPEC DG0097
10. DRAWER BOTTOM BRACKET
11. T-ELEVATING BAR
12. SHIPPING BRACKET ASSEMBLY
13. KAOWOOL - 0.5 IN. (1.27 CM) THICK. POLYETHELENE (4 MIL) WIRE MESH 1 IN. (2.54 CM). STANDARD STEEL PACKING STRAPS 0.5 IN. (1.27 CM) WIDE. AECL CP SPEC P0121
14. PACKING MATERIAL
15. SHIELD COLLAR (END USE ONLY)
16. HOIST SLING
17. SHOULDER EYELET (2)
18. 0.5 IN. (1.27 CM) THICK PLYWOOD CRATE
19. SHIELDING PLUG (END USE ONLY)
20. UPPER DRAWER (END USE ONLY)
21. RADIATION CAUTION PLATE (2) - AECL CP SPEC DG0096
22. AECB CERTIFICATION PLATE (2) - AECL CP SPEC DG0097
23. 1/2 IN-13 x 9 IN LG SQ HD BOLTS (3)
24. SHIPPING BRACKET (2) WITH 5/8 IN-11 x 1-1/4 IN. LG HEX HD SCREWS (8)
25. CATEGORY III LABEL (2) - AECL CP SPEC DG0102

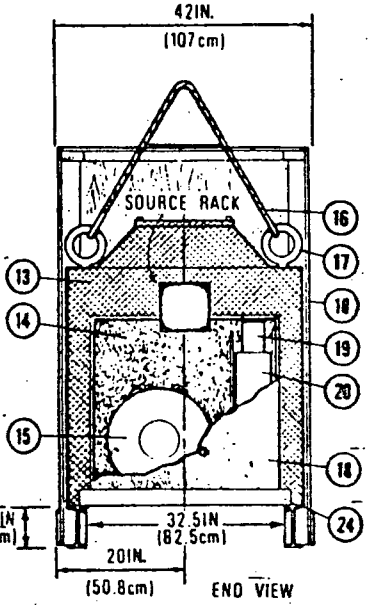


NOTES

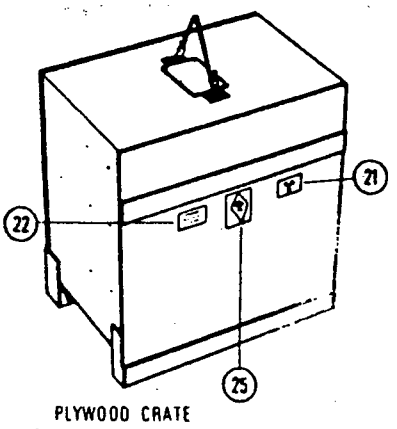
I.A.E.A. - TYPE B(u) CAPACITY - 26,000 Ci **Co
GROSS WEIGHT 3500 LB (3856 KG) AECB CERT. CDN/2013/B(U)T
PROJECTED FLOOR LOADING 468 LB/SQ FT (0.23 KG/SQ CM)
FLOOR AREA 18.2 SQ FT (APPROX)
16 910 SQ CM (APPROX)



SIDE VIEW



END VIEW



PLYWOOD CRATE

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
P.O. BOX 6300, Postal Station J, OTTAWA, CANADA. K2A 3W3

TITLE: GAMMACELL 220 "LIVE" SOURCE HEAD CRATING FOR SHIPMENT

REF. DWG. A01885	REVISED JUNE 12, 1975
DATE 31 JANUARY 1975	No. DS-0284 REV. A
DRAWN KB / CHECKED / APPROVED	SHEET 9930

OMIT
KEYWORD INDEX

LABELLING
GAMMACELL 220

APPLICABLE DOCUMENTS

Spec DG0086 Mandatory Labelling Procedures - Product Licensing, General Directive.

Item 1 "Caution" with curie content label (1 off) Spec DG0095, drawing A00511, shall be mounted, adjacent to item 2, on right side of sheet metal superstructure (facing the front of the unit). The label shall be positioned approximately 1 ft above the platform and mounted with machine screws, round head, Phillips, steel, cadmium plated, #8 x 32 x ¼ in.

Item 2 "A.E.C.B." shipping label (1 off) - replaces B.T.C. version, Spec DG0097, drawing A01828, shall be mounted, adjacent to item 1, on right side of sheet metal superstructure (facing the front of the unit). The label shall be positioned approximately 1 ft above the platform and mounted with machine screws of the type and size specified in item 1.

Item 3 "Caution" shipping labels (2 off) Spec DG0096, drawing A03621 - the labels shall be attached, adjacent to item 4, to wire mesh on two opposite sides on the thermal insulation package. The labels shall be secured on four corners with suitable soft iron wire.

Item 4 "A.E.C.B." shipping label (2 off) - replaces B.T.C. version, Spec DG0097, drawing A01828 - the labels shall be attached, adjacent to item 3, to wire mesh on two opposite sides on the thermal insulation package. The labels shall be secured on four corners with suitable soft iron wire.

Item 5 "Caution" shipping labels (2 off) Spec DG0096, drawing A03621 - the labels shall be mounted, adjacent to item 6, on two opposite sides of the outer packaging, crating, or fire shield. Wood screws, round head, steel, cadmium plated #8 x ½ in shall be used to mount the labels. Spec DG0103 indicates approximate location.

Item 6 "A.E.C.B." shipping labels (2 off) - replaces B.T.C. version, Spec DG0097, drawing A01828 - the labels shall be mounted, adjacent to item 5, on two opposite sides of the outer packaging, crating, or fire shield. Wood screws, round head, steel, cadmium plated #8 x ½ in shall be used to mount the labels.

ATOMIC ENERGY OF CANADA LIMITED
COMMERCIAL PRODUCTS
P.O. BOX 6300, Postal Station J, OTTAWA, CANADA.

TITLE: MANDATORY LABELLING - GAMMACELL 220

REF. DWG.

DATE November 8, 1968

DRAWN	CHECKED	APPROVED
D.X.L.	E.H.K.	E.O.X.

REVISED No. DS0115

Item 7 "Category III" shipping labels (2 off) as per I.A.E.A. specification (A.E.C.L. Spec DG0102) - the labels shall be affixed on two opposite sides of the outer packaging, crating, or fire shield. The labels shall be centrally located on the applicable surface. Spec DG0103 indicates approximate location.

Item 8 "Special Graphics (2 off each) related to unit specifications i.e., high centre of gravity, international wine glass symbol, crate no., crate dimensions (overall length, width, height), gross weight and floor loading, unit model, serial no., hoist cable configuration etc., displayed in black on two opposite sides of the outer packaging, crating, or fire shield. Spec DG0103 indicates approximate location.

Item 9 "C.S.A." two piece certification label (1 off), Spec DG0098, drawing A01829, shall be affixed to rear sheet metal enclosure.

ATOMIC ENERGY OF CANADA LIMITED COMMERCIAL PRODUCTS P.O. BOX 6300 Postal Station J, OTTAWA, CANADA.	TITLE: MANDATORY LABELLING - GAMMACELL 220				
	REF. DWG.			REVISED	
	DATE November 8, 1968			No.	REV.
	DRAWN	CHECKED	APPROVED	DS0116	
	L.X.J.			SHEET 2 OF 2	