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

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED BY OMB 3150-0120
Expires: 6-30-89

APPLICATION FOR MATERIAL LICENSE

030-20795

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

APPLICATIONS FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

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

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

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

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

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

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

IF YOU ARE LOCATED IN:

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

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

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

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

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

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

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

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

- [ ] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER ____________
- [X] C. RENEWAL OF LICENSE NUMBER 29-00651-04

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

GE ASTROSPACE DIVISION
P.O. Box 800
Princeton, N.J. 08543-0800

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

GE ASTROSPACE DIVISION
Intersection Route 571 & 535
East Windsor, N.J. 08520

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION: Lester Jung

TELEPHONE NUMBER: (609) 426-2132

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

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

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

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

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

9. FACILITIES AND EQUIPMENT.

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSEE FEES *(See 10 CFR 170 and Section 170.31)*
FEE CATEGORY 3E
AMOUNT ENCLOSED $ 170.00

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

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

WARNING: 18 U.S.C. SECTION 1001 ACT OF JUNE 25, 1948, 62 STAT. 749 MAKES IT A CRIMINAL OFFENSE TO MAKE A WILLFULLY FALSE STATEMENT OR REPRESENTATION TO ANY DEPARTMENT OR AGENCY OF THE UNITED STATES AS TO ANY MATTER WITHIN ITS JURISDICTION.

SIGNATURE–CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
Surinder Singh Seehra	Surinder S. Seehra	Manager Physical Effects Group	oct. 25, 88

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REG1 LIC30
29-00651-04 PDR

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS	APPROVED BY
REN	Nov. 5 I	3E		S. Kimberley

AMOUNT RECEIVED	CHECK NUMBER	DATE
$170	106957 (RCA)	11/17/88

109784

OFFICIAL RECORD COPY ML 10

28 OCT 1988

Item 5
NRC Form 313

October 11, 1988
NRC License 29-00651-04

RADIOACTIVE MATERIALS TO BE POSSESSED

A)	Element and mass number	-	Cobalt-60
B)	Chemical/Physical form	-	Solid/Sealed Source
C)	Maximum amount to be possessed at any one time	-	13,200 Curies
D)	Irradiator information:		
	Manufacturer	-	Atomic Energy of Canada, Ltd. P.O. Box 6300 Ottawa, Canada K2A 3W3
	Model*	-	Gammacell 220

* Attachment A to Item 5 provides additional information about this research irradiator.

Item 5
Attachment A
NRC Form 313

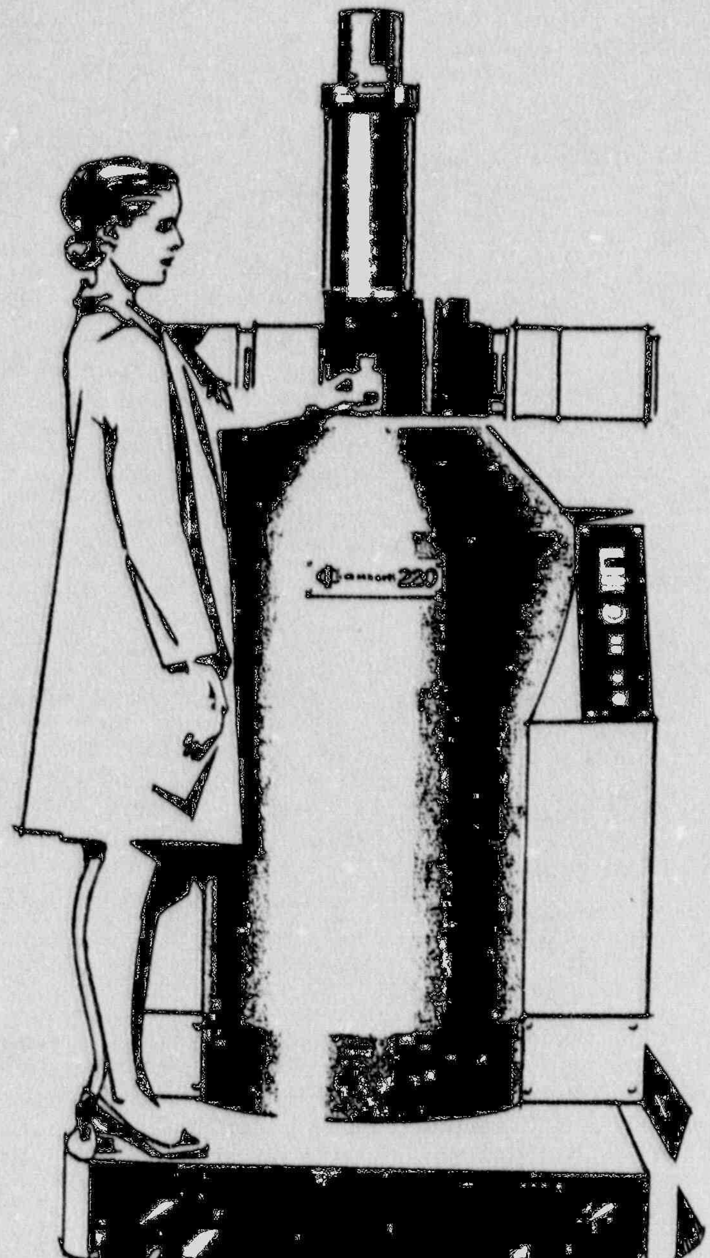
NRC License 29-00651-04
October 11, 1988

SPECIFICATIONS

Number JS300 April 1981

Gammacell 220 Research Irradiator

Atomic Energy of Canada Limited, Commercial Products, P.O. Box 6300, Ottawa, Canada K2A 3W3



THE GAMMACELL 220 is the most popular of the AECL line of high dose rate research irradiators. Over 180 have been installed in laboratories throughout the world. They are being used in a wide range of studies in the fields of medical product sterilization, biological and genetic effects, food preservation, growth stimulation, chemistry, pollution, radiation effects on materials, sterile male technique and the irradiation of semiconductors. This unit has been designated by the USNRC as acceptable for licensing in the U.S.A. It has been approved by the Canadian Standards Association (C.S.A.). Exposure dose rates up to 2.0×10^6 Roentgens per hour at the mid-point of the irradiation chamber can be provided with a nominal source loading of 24,000 Curies of Cobalt 60.

A. LICENSING

When applying for a U.S. Radioactive Materials or a Canadian AECB License the customer should send AECL-CP a copy of the licence 6 weeks prior to the estimated shipping date and should apply for 10% more Cobalt 60 than ordered to allow for the ± 10% loading tolerance.

B. COMPONENT PARTS

B.1 Radiation Shield — The radiation shield consists of a large steel-encased lead barrier with provision for housing the Cobalt 60 source. Forming an integral part of the shield is a removeable steel-encased lead plug which permits the loading of the source at the centre of the shield. Mounted on the top of the main shield is an additional split lead collar which provides secondary shielding when the drawer is in motion.

B.2 Radioactive Source — The Cobalt 60 source consists of up to 48 linear source elements (Model C198) equally spaced in a stainless steel rack to form a radioactive cylindrical shell or annulus 20.9 cm (8.25 in) measured between the centres of opposing elements. Each linear element consists of a welded stainless steel pencil filled with Cobalt 60 in the form of metallic cobalt.

Internal dimensions of each pencil are 1 cm (0.395 in) diameter and 20.3 cm (8 in) length. The source is secured in the centre of the radiation shield. Cobalt 60 generates 15.374 watts/kcurie.

B.3 Drawer — The drawer is centrally located in the radiation shield and is power-driven vertically through the centre of the source. Material to be irradiated is placed in the sample chamber, then lowered to the irradiation position i.e.: the sample chamber is then in the centre of the source.

The motor-driven drawer consists of four sections: — an access tube shielding plug, an upper shield, a sample chamber, and a lower shield, each as described below.

(a) Access Tube Shielding Plug — A lead-filled steel cylinder which is hinged at the back of the drawer top. This plug prevents excess radiation leakage through the access tube when the sample chamber is in the "irradiate" or "down" position. An electrical interlock immobilizes the unit if the shielding plug is in the open position.

(b) Drawer — Upper Shield — The upper shield consists of a stainless steel-encased lead cylinder containing one straight access tube.

Access Tube Dimensions:-

Internal Diameter —	3.17 cm (1.25 in)
Thread at top —	1-3/8 in — 12 TPI American Standard Fine

(c) Sample Chamber — The sample chamber is a hollow, thin-walled, cylinder constructed of anodized aluminum. A removeable door provides easy access. The door is locked by means of a chrome-plated, steel locking ring around the top of the chamber. Electrical interlocks are provided on both the door and locking ring to ensure their correct location before the machine will operate. A 3.5 cm (1.375 in) diameter hole in the roof of the chamber provides entry to the access tube in the Drawer Upper Shield. A hole in the bottom of the chamber provides access to the drain tube in the Drawer Lower Shield.

Sample Chamber Dimensions (internal):-

Height: —	20.6 cm (8.125 in)
Diameter: —	15.2 cm (6 in)
Volume: —	3,610 cm^3 (220 in^3)
Door Opening: —	20 cm (7.875 in) high x 15.2 cm (6 in) wide

(d) Drawer — Lower Shield — The lower shield consists of a stainless steel-encased lead cylinder with a 1.1 cm (0.44 in) inside diameter spiral stainless steel drainage tube passing through it from the bottom of the sample chamber to an outlet underneath the unit.

B.4 Main Frame — The radiation shield is mounted on a steel frame with an operator platform at the front of the unit. A cavity 17.8 cm (7 in) high and 81.3 cm (32 in) wide runs underneath the entire length of the unit and is used for movement of the unit with a lift truck.

C. CONTROLS

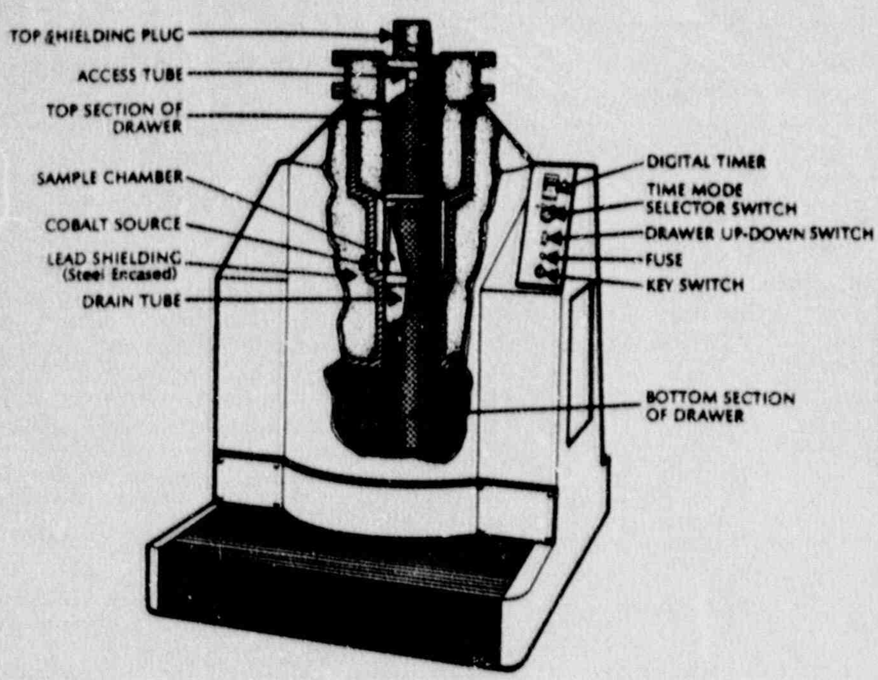
Control of the unit is from the central panel mounted on the front face of the unit. The control panel includes the following: —

- Drawer movement control switch for raising or lowering the sample drawer under manual control.
- Digital Timer with a range of 0.1 — 999.9 calibrated in hours, minutes and seconds. The timer is automatically repetitive permitting continuous experiments of the same time interval to be completed by pressing the reset button.
- Mode Selector Switch which enables the operator to select time units desired, or manual control.
- Key Operated Master Switch providing power supply to the unit and control panel.
- Control Circuit Fuse.

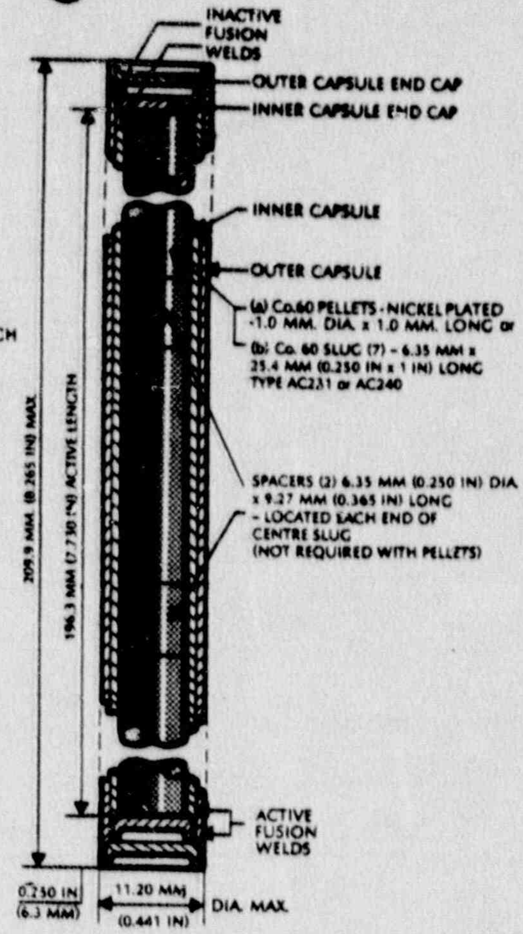
The drawer can be operated manually by means of a crank in the event of power failure.

D. External Radiation Levels — At 5 cm (2 in) from the surface of the unit the average exposure rate will not exceed 20 mR/h, and the maximum exposure rate will not exceed 100 mR/h.

At 100 cm (39.4 in) from the centre of the source the average exposure rate will not exceed 2 mR/h, and the maximum exposure rate will not exceed 10 mR/h.



GAMMACELL 220 WITH SAMPLE CHAMBER IN IRRADIATE POSITION



NOTES ON GAMMACELL 220 PENCIL :-

1. ALL DIMENSIONS IN MILLIMETERS AND INCHES
2. CAPSULE MAT'L — NO. 316 ELC STAIN. STL.
3. DIMENSIONS SHOWN ARE AT 20° C (68° F).
4. CAPSULE ENGRAVED — A.E.C.L. Co. 60, C-198 and Serial Number as specified.

GAMMACELL 220 PENCIL
(Pellet or Slug Type)

E. WEIGHTS & DIMENSIONS

Dimensions	Centimetres	Inches
Overall Width	101.6	40.0
Overall Length	152.4	60.0
Overall Height (drawer up)	212.4	83.6
Overall Height (drawer down)	157.8	62.2
Weight		
Total Weight	3,765 kg	(8,300 lb)
Floor Loading	2,430 kg/m²	(498 lb/ft ²)

F. ELECTRICAL POWER REQUIREMENTS

220 Volts — 3 phase — 50 or 60 Hz —
0.75 kVA (1/2 H.P. motor).

G. INSTALLATION

Minimum wall clearances for the Gammacell 220 (facing unit) are:

Rear Wall	36 cm	(14 in)
Right Hand Wall	36 cm	(14 in)

H. SHIPPING

The Gammacell 220, complete with Cobalt 60 source, is shipped without additional radiation shielding. Its design and construction comply with the Canadian and U.S.A. regulations covering transportation of radioactive material.

Crated Weight:—	3,949 kg	(8,700 lb)
Crated Dimensions:—		
Height	175.3 cm	(69 in)
Width	140.3 cm	(55.25 in)
Length	162.6 cm	(64 in)

I. CERTIFICATION & DOCUMENTATION

A set of idodose curves is supplied with each unit showing the distribution of the dose rate in the sample chamber.

Actual dose rate values are normally within 5% of those indicated by the isodose chart.

The dose rate at the mid-point of the sample chamber is measured by ferrous chemical dosimetry, the accuracy being ± 3.5%. A Certificate of Calibration is supplied with each unit.

The Cobalt 60 pencils in the source are individually tested for leakage and contamination. A certificate describing the tests performed is supplied with each unit.

An Operation and Maintenance Manual is shipped with each unit.

GAMMACELL 220
ACCESSORY EQUIPMENT

All accessories may be field installed

• Designed for use on all units above Serial no. 45 or on units fitted with a Drawer Top incorporating the straight access tube.

A. FOOD & DRUG VIAL RACK (J-321)

Designed to hold up to 24 food or drug vials each 6.89 cm (2.75) in long by 2.06 cm (0.81 in) diameter. The Rack locates vials in the Gammacell 220 sample chamber at points of equivalent dose rate.

B. ATTENUATORS (J-325)

Set of three lead attenuators which when placed in the sample chamber serve to reduce the dose rate. All attenuators are constructed in the form of a hollow cylinder with external diameter 15.2 cm (5.94 in) and length of 20.0 cm (7.875 in).

Attenuator Internal Diameter	% Central Dose Rate
12.46 cm (4.91 in)	45
11.11 cm (4.375 in)	30
7.06 cm (2.78 in)	10

Typical idodose curves are shown on drawings J300-x-2, J300-x-3, J300-x-4.

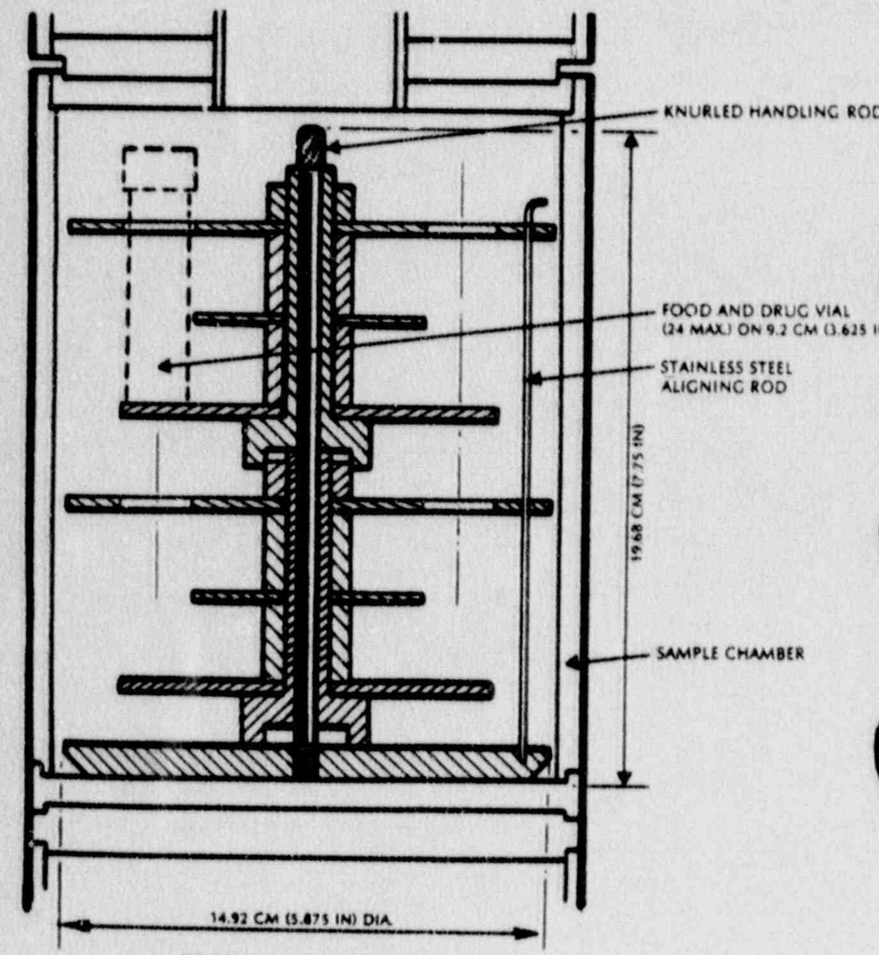
A tong-type removing tool is supplied with the attenuators.

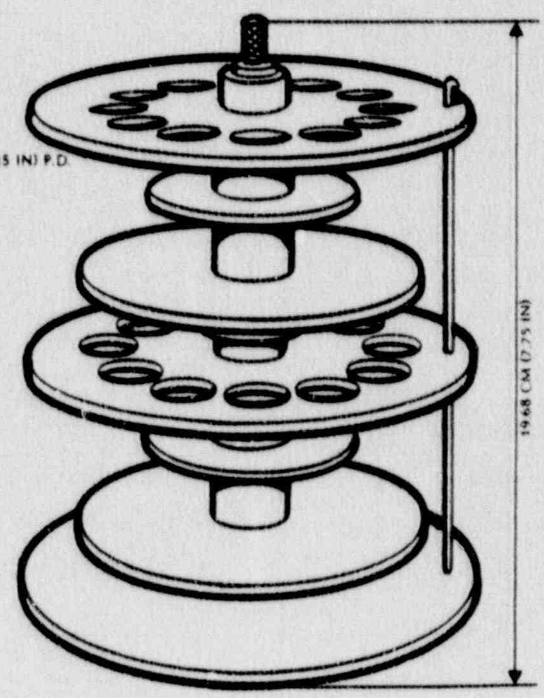
C. ACCESSORY TUBE INSERT (J-322) •

A bundle of stainless steel tubes specially constructed to fit within the access tube of the Gammacell 220 and permit easy passage of coolants, electrical wiring etc., from a point exterior to the unit to accessories located in the sample chamber. A bundle consists of two tubes 0.79 cm (0.31 in) O.D., two tubes 0.635 cm (0.25 in) O.D., and one tube 0.476 cm (0.19 in) O.D.. All tubes have 0.071 cm (0.028 in) wall thickness.

This accessory is required with Cat. Nos. J-323, J-324 and J-328.

J - 321 FOOD AND DRUG VIAL RACK

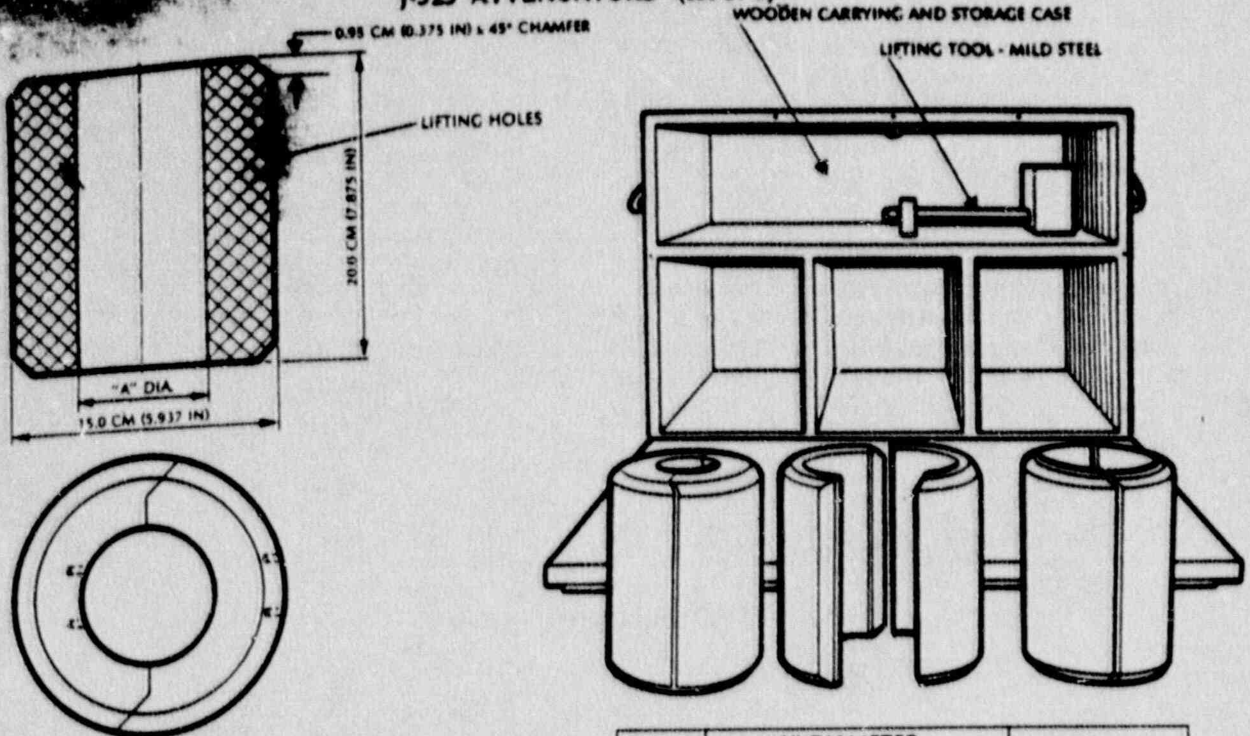




SECTIONAL VIEW OF VIAL RACK INSIDE SAMPLE CHAMBER

NOTES:
1. Material — all aluminum construction
2. Capacity — 24 vials, 2.1 cm (0.82 in) diameter x 7.0 cm (2.75 in) high. Volume: 16 ml per vial
3. Bracketed dimensions represent inches
4. Shipping weight: 1.47 kg (3 lb 4 oz)

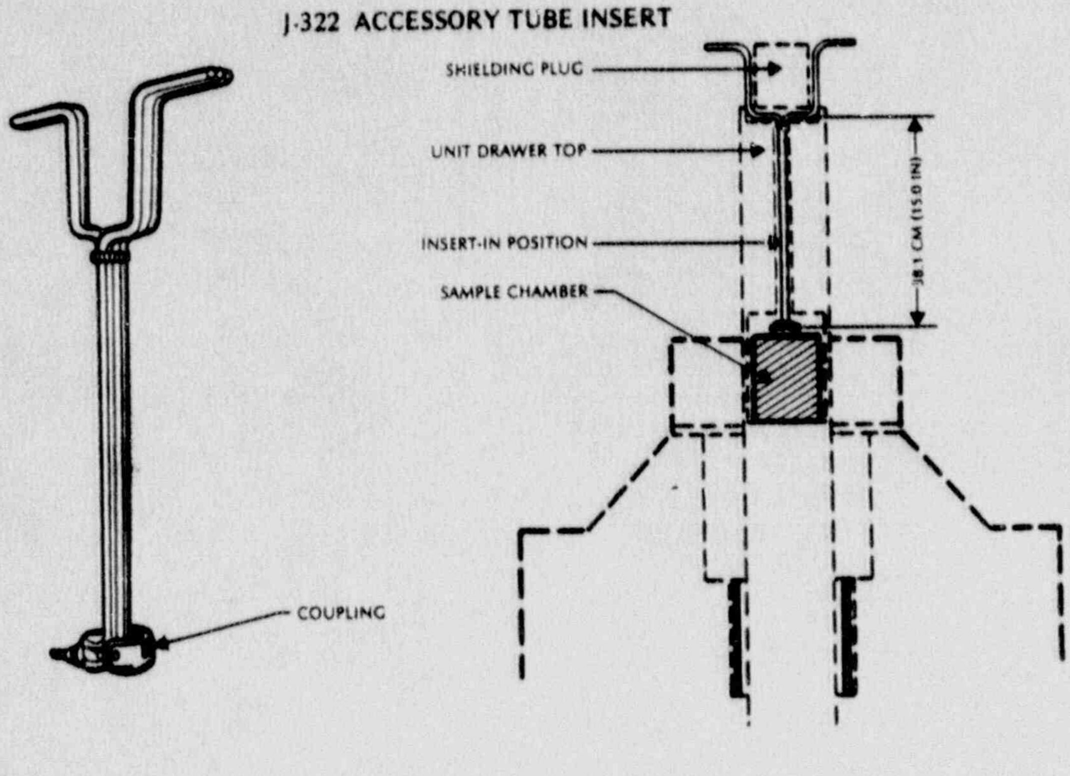
J-325 ATTENUATORS (set of 3)



NOTES:
1. Material - Lead (6% Antimony); ASTM B-29-55 Piglead; or ASTM B-325-58T Refined Secondary Lead Minimum Purity - 99.85%
2. Bracketed dimensions represent inches
3. Shipping weight — 68.04 kg (150 lb)

ITEM NO	"A" DIAMETER		Attenuation Factor %
	Inches	Centimetres	
1	2.781	7.06	90%
2	4.375	11.11	70%
3	4.906	12.46	50%

J-322 ACCESSORY TUBE INSERT



NOTES:
1. Material - Stainless Steel Construction
2. Bracketed dimensions represent inches.
3. Accessory tube inside diameters — 2 tubes - 0.79 cm (0.31 in) — 2 tubes - 0.635 cm (0.25 in): — 1 tube 0.476 cm (0.19 in)
4. This accessory is designed for use in conjunction with A) Product No. - J-323 High Temperature Chamber; B) Product No. -J324 Low Temperature Chamber; C) Product No. - J328 Irradiation Helix Tube
5. Shipping Weight — — 1.17 kg (2 lb - 9 oz)

D. IRRADIATION HELIX (J-328) •

Stainless steel coil constructed of 0.79 cm (0.31 in) O.D. tubing with 0.071 cm (0.028 in) wall thickness which fits inside the sample chamber. Utilized for continuous circulation of fluids and gases during irradiation.

Accessory No. J-322 is required with the Irradiation Helix.

E. MAGNETIC STIRRER (J-327) •

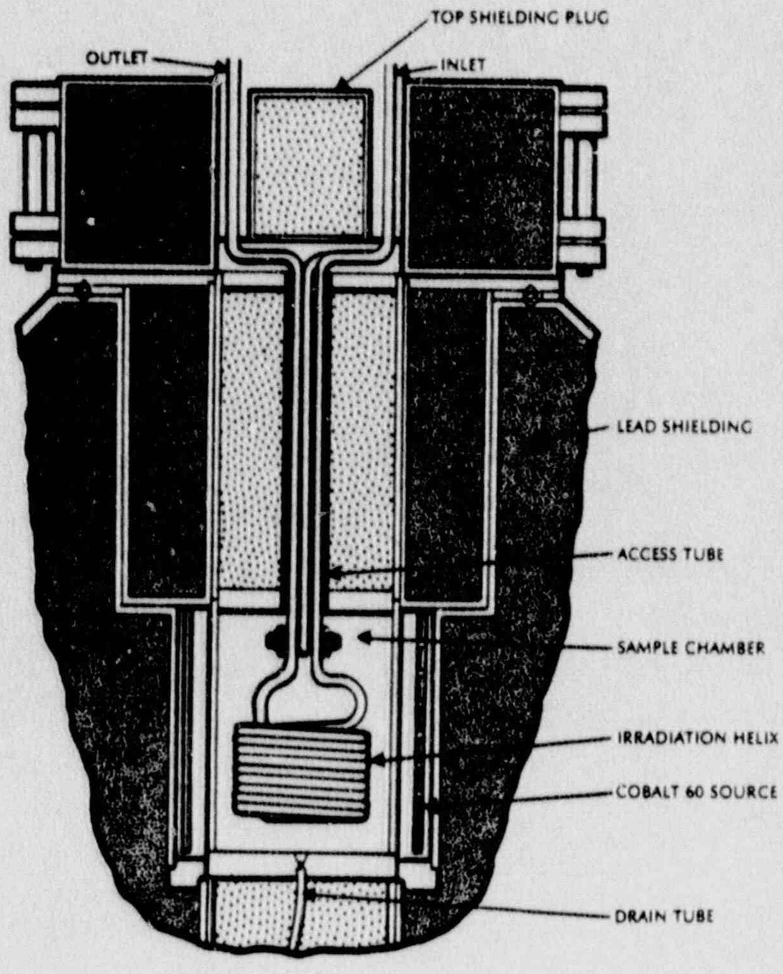
Provides continuous stirring of materials which must be irradiated in a sealed container. Stirrer is used with a drive unit positioned external to the Gammacell 220 and supplied as a separate item (J - 333).

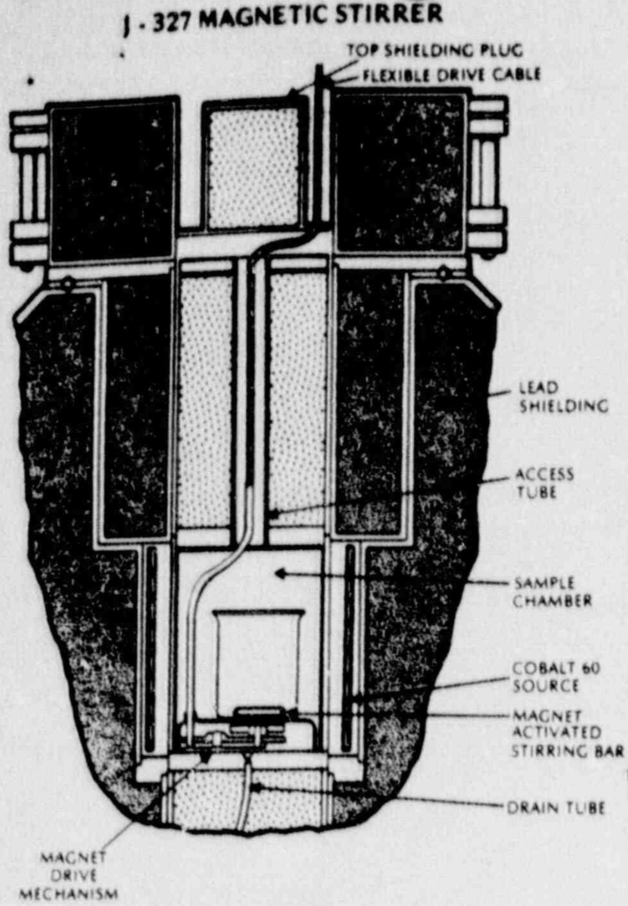
F. LOW TEMPERATURE CHAMBER (J-324) •

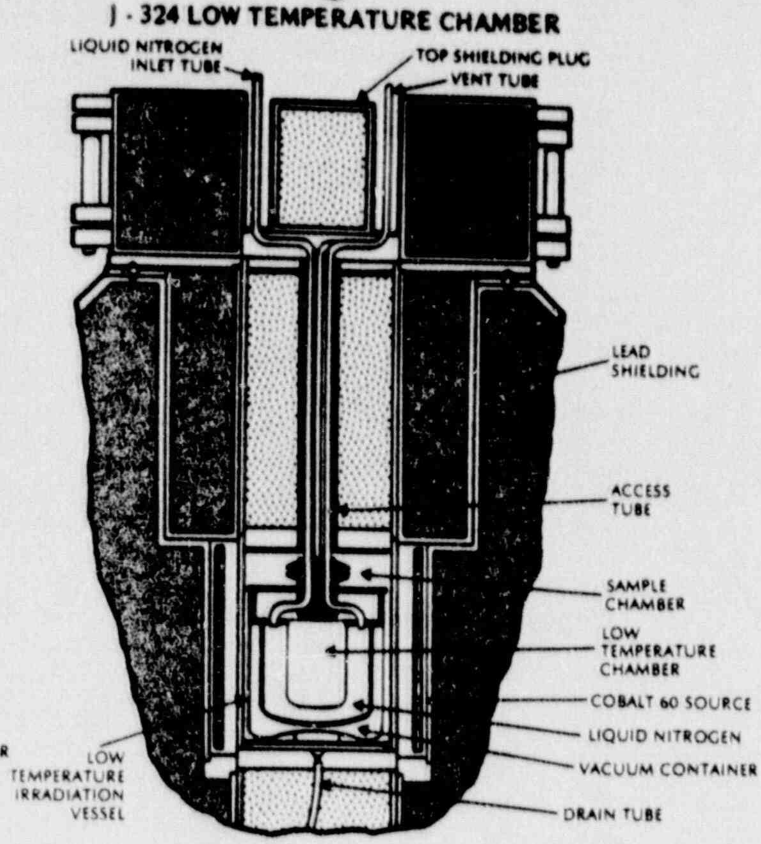
Specially constructed Dewar vessel fits inside the standard sample chamber of the Gammacell 220. Samples, during irradiation, may be maintained at temperatures down to that of liquid nitrogen at -195° C (-319° F) at an ambient temperature of 57° C (135° F). Coolants, other than liquid nitrogen, may be utilized to maintain intermediate low temperatures. A liquid level probe utilizing two solid state level sensors is provided for control of liquid nitrogen level in the coolant space. Usable irradiation space inside the Low Temperature Chamber is 6.90 cm (2.75 in) diamater by 10.16 cm (4.0 in) high.

Accessory No. J-322 is required with the Low Temperature Chamber.

J-328 IRRADIATION HELIX







G. FIELD FLATTENER (J-348)

This contour-type attenuator provides greater dose rate uniformity, as shown on drawing J300-x-5. The central dose rate is 56% of that without the attenuators. The internal diameter of this accessory is 125 mm (4.94 in).

H. LIQUID NITROGEN LEVEL CONTROLLER (J-256)

Provides continuous control of liquid nitrogen level within the Low Temperature Chamber.

For complete control of the Low Temperature Chamber the customer must provide a storage dewar for liquid nitrogen to the accessory tube which connects with the Low Temperature Chamber. The discharge line must have a suitable solenoid valve which will be used to control the flow.

The controller provides power to the discharge line solenoid when the liquid level drops below the lower sensor in the cold chamber and maintains the power until the upper sensor is immersed in liquid nitrogen. Therefore, the liquid nitrogen level is maintained between the upper and lower sensors which are spaced 1.27 cm (0.5 in) apart.

J-327 MECHANICAL STIRRER (J-326) *

Provides continuous stirring of liquids during irradiation. The Mechanical Stirrer is recommended for materials of high viscosity. The Stirrer is used with the drive unit positioned external to the Gammacell 220 and supplied as a separate item (J-333).

J. MOTOR DRIVE UNIT (J-333) *

This unit is required for use with both stirrer accessories J-326 and J-327.

The drive unit consists of the following components:—

(a) A small 115 volt electric motor and speed reducer supported on an adjustable mounting bracket.

(b) A variable speed selector coupled into the motor circuit to control motor revolutions and accessory rotation speed.

(c) A flexible drive shaft to conduct motive power from the speed reducer to the sample chamber equipment.

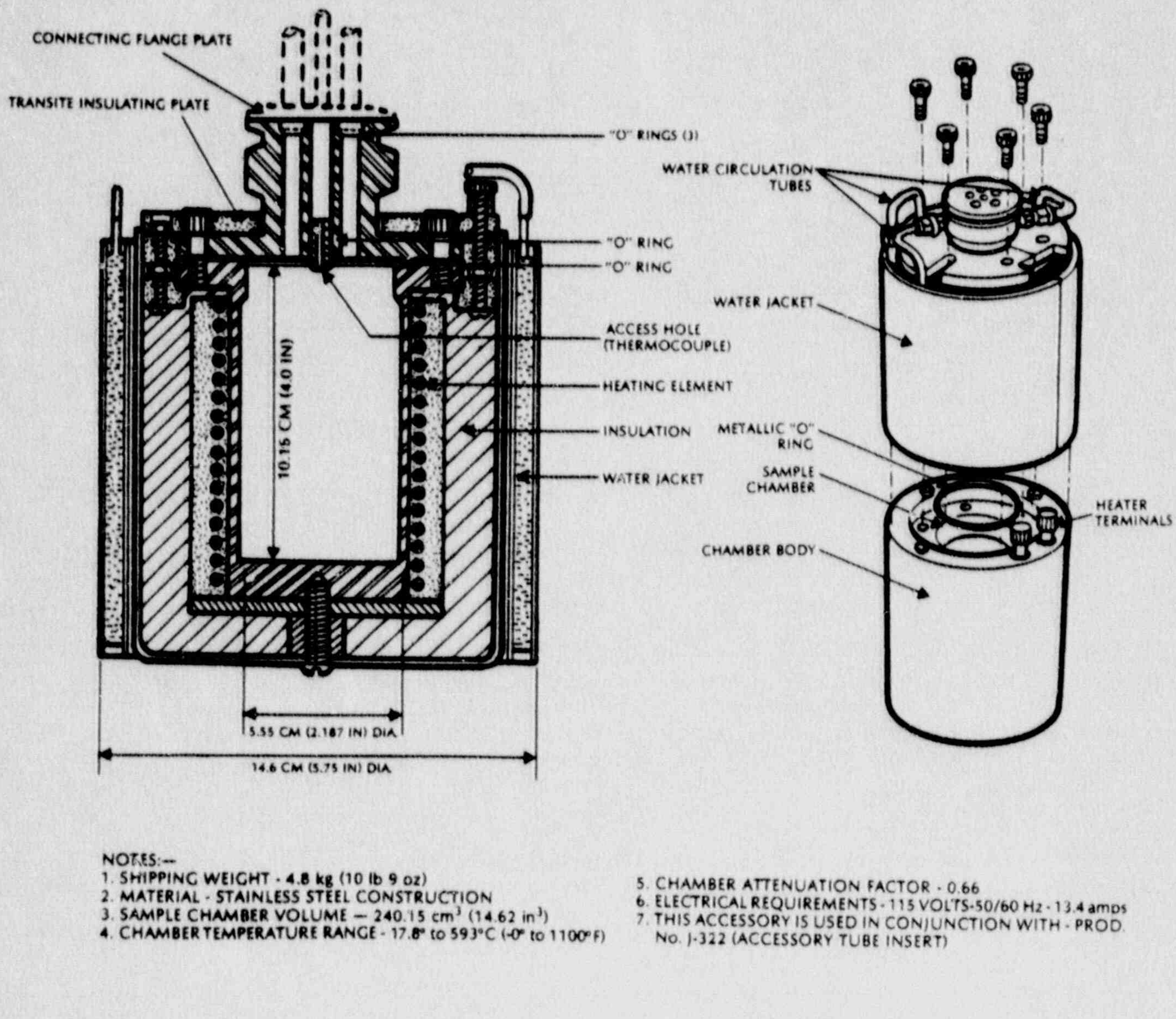
The Motor Drive Unit is suspended from the mounting bracket on a vertical post screwed into the unit drawer top. The flexible drive cable is coupled to the reducer socket and travels through the drawer top access tube to the unit sample chamber.

K. HIGH TEMPERATURE CHAMBER (J-323) *

Electrically heated and water cooled chamber fits inside the standard sample chamber of the Gammacell 220. Samples, during irradiation, may be maintained at temperatures up to 538° C (1000° F). Usable irradiation space inside the High Temperature Chamber is 5.56 cm (2.19 in) diameter by 8.89 cm (3.5 in) high.

Accessory No. J-322 is required with the High Temperature Chamber.

J-323 HIGH TEMPERATURE CHAMBER



NOTES:—
1. SHIPPING WEIGHT - 4.8 kg (10 lb 9 oz)
2. MATERIAL - STAINLESS STEEL CONSTRUCTION
3. SAMPLE CHAMBER VOLUME — 240.15 cm^3 (14.62 in^3)
4. CHAMBER TEMPERATURE RANGE - 17.8° to 593°C (-0° to 1100°F)
5. CHAMBER ATTENUATION FACTOR - 0.66
6. ELECTRICAL REQUIREMENTS - 115 VOLTS-50/60 Hz - 13.4 amps
7. THIS ACCESSORY IS USED IN CONJUNCTION WITH - PROD. No. J-322 (ACCESSORY TUBE INSERT)

The specifications contained herein were in effect at the time of printing. Atomic Energy of Canada Limited has a policy of continuing development and reserves the right to discontinue models at any time or change specifications or designs without notice incurring obligation.

Atomic Energy of Canada Limited, **Commercial Products** P.O. Box 6300, Ottawa, Canada K2A 3W3
TELEPHONE: (613) 592-2790 TELEX: 053-4162 CABLE: "NEMOTA"

Item 6
NRC Form 313

October 11, 1988
NRC License 29-00651-04

PURPOSE FOR WHICH LICENSED MATERIAL WILL BE USED

The Gammacell 220 is to be used for determining the effects of radiation on semiconductor devices and materials which are used on various spacecraft systems.

Item 7
NRC Form 313

October 11, 1988
NRC License 29-00651-04

INDIVIDUALS RESPONSIBLE FOR RADIATION SAFETY PROGRAM

FULL NAME	DUTIES
Surinder S. Seehra	Radiation Protection Officer
Lester A. Jung	Assistant Radiation Protection Officer
Dr. George J. Brucker	Consultant

Attachments A-C give the resumes of the above mentioned individuals showing their radiation training and experience.

Item 7
Attachment A
NRC Form 313
Resume

NRC License 29-00651-04
Renewal Application 10/11/88

NAME: Mr. Surinder S. Seehra
TITLE: Manager, Physical Effects Group
(Radiation Protection Officer)

I. Position Description

Responsible for all engineering effort associated with radiation, ESD, contamination and micrometeoriod effects to the spacecraft from the natural and induced environments. This includes analysis and laboratory work to assess the effect of ESD and radiation at the part and subsystem levels and the design of hardening to secure system performance goals and analysis to assess the effects of contamination and micrometeoroid effects. Mr. Seehra is also responsible for the administrative, training and certification of personnel using radioactive sources. Mr. Seehra will not, generally, be involved with handling or using radioactive material covered under this application for license but will assure proper controls, handling, storage, leak testing, emergency action, disposal, records, and limited access required by the Astro Radiation Protection Program (item 10.1).

II. Experience

Mr. Seehra has over 20 years of experience (3.5 years in the present position) in various teaching and technical positions. This includes over 15 years experience in fields associated with radiation effects in materials and devices.

III. Radiation Training

Mr. Seehra has completed the Astro Radiation Protection Training Course (Attachment A, Item 8). Other formal training is as follows:

Institution/Company	DURATION
a. Surrey University, England	3 Months
b. Aligarh University, India/ Surrey University, England	3 Months
c. Aligarh University, India Surrey University, England	2 Years
d. Surrey University, England Royal Military College of Science, England	1 Month

Mr. Seehra received his B.S. and M.S. in Physics from India, M.S. in Physics of Electronic Devices from University of London, and undergone three years Graduate Studies at Surrey University, England.

NAME: Mr. Surinder S. Seehra
TITLE: Manager, Physical Effects Group
(Radiation Protection Officer)

NRC License 29-00651-04
Renewal Application 10/11/88

Resume
Page 2

IV. Experience, Radioactive Materials/Accelerators

MATERIALS	AMT. (Max)	LOCATION	DURATION
Van De Graaff Accelerator	2 MeV	Surrey University, England	3 Years
Linear Heavy-ion Accelerator	300 kev		
^{60}Co, ^{90}Sr	10 m Ci	Marconi Space & Defense Systems, Stanmore, England	3.5 Years
^{60}Co	12000 Ci	GE Solid State Devices Somerville, N.J.	
^{60}Co	4800 Ci	GE Space Center Valley Forge, PA	9.5 Years
^{60}Co ^{137}Cs	3500 Ci 5 Ci	Fort Monmouth Radiation Lab., Belmar, N.J.	
^{60}Co	13000 Ci	GE Astro-Space Division East Windsor, N.J.	

The last four Radiation Facilities were used for irradiating devices while working at GE Astro-Space Division.

NAME: Lester A. Jung
TITLE: Member Technical Staff
(Radiation Protection Officer - Assistant)

I. Position Description

Engineer, Physical Effects Group.
Perform analysis and determine designs for contamination and space environment effects. Space environment effects includes the natural environment, i.e. atomic oxygen and radiation, and induced environment, i.e., nuclear events. Radiation effects testing for physical and thermal-optical properties changes of materials is performed by Mr. Jung. Has performed radiation effects using the in-house Cobalt-60 facility. Mr. Jung also provides technical expertise to the Astro Radiation Protection Program as Assistant Radiation Protection Officer.

II. Experience

Mr. Jung has 4 1/2 years experience at GE Astro-Space Division in radiation analysis and material experiments. In the area of radiation protection, Mr. Jung has worked under the supervision of Mr. Seehra for 4 1/2 years assisting in the facility's radioactive material handling programs. He has also assisted the facility's Radiation Safety Officer in setting up and providing shielding determination for the facility's X-ray machines.

III. Radiation Training

Mr. Jung has completed the Astro Radiation Protection Training Course (Attachment A, Item 8). Other formal training includes two courses in nuclear physics at the United States Military Academy, West Point, N.Y.

Item 7
Attachment C
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NAME: Dr. George J. Brucker
TITLE: Senior Staff Engineer

I. Position Description

Responsible in a consulting and experimental capacity for research, engineering development, and test programs in the radiation effects field relative to all GE corporate divisions engaged in hardening semi-conductor devices, ground systems, and spacecraft against both the natural and nuclear burst radiation environments.

II. Experience

Dr. Brucker has over 36 years of experience in the field of radiation effects with extensive experimental application and use of radiation sources and equipment. For one year he worked in the health physics field as it applies to reactor safety. For ten years he was Radiation Protection Officer at Astro responsible for the administrative, technical and control aspects of the radiation sources.

III. Radiation Training

Location	Duration
American Machine and Foundry, Reactor Div. Greenwich, Conn.	1 Year
Fort Monmouth, N.J.	12 Years
New York University, N.Y.	
Fort Monmouth, N.J.	36 Years
GE Astro-Space Div. and David Sarnoff Lab.	

IV. Experience, Radioactive Materials and Accelerators

Materials	Amount	Location	Duration
^{60}Co,	3000 Curies	Fort Monmouth, N.J.	12 Years
^{137}Cs	5 Curies	"	"
^{90}Sr	10 m Ci	"	"
Ra-Be	10 m Ci	"	"
Po^{210}	1 m Ci	"	"
^{60}Co	12,000 Curies	GE Solid State Devices Somerville, N.J.	10 Years
^{60}Co	13,000 Curies	GE Astro Space Div. East Windsor, N.J.	2 Years
^{60}Co	100 Curies	Naval Research Lab. Washington, D.C.	2 Years
^{60}Co	5,000 Curies	Hanscom Air Force Base	3 Years

Accelerators	Location	Period Covering Experimental Usage
20 MeV Linac	Boeing, Seattle, WA	12 Years
30 MeV Linac	IRT, San Diego, CA	2 Years
30 MeV Linac	Naval Research Lab., Wash. DC	2 Years
20 MeV Linac	Hanscom Air Force Base	5 Years
6 MeV Linac	Maryland University	1 Year
2 MeV Flash X-Ray	Hanscom Air Force Base	1 Year
2 MeV Van de Graaff	Fort Monmouth, NJ	10 Years
1 MeV Van de Graaff	RCA Laboratories, Princeton,NJ	20 Years
5 MeV Van de Graaff	Naval Research Laboratory, Washington, D.C.	2 Years
2 MeV Van de Graaff	Naval Research Laboratory, Washington, D.C.	2 Years
8 MeV Van de Graaff	Rutgers University, New Brunswick, NJ	1 Year
Reactors		
Triaga Reactor	Maryland University	1 Year
Fast Pulse Reactor	Aberdeen Proving Grounds, Aberdeen, MD	4 Years
Research Swimming Pool Reactor	IRL, Paulsboro, NJ	2 Years

TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS

Personnel who operate the Gammacell-220 receive training in two parts:

1) Handling of radioactive materials, and
2) Operation of the research irradiator.

All individuals who handle radioactive materials attend a Radiation Protection Training Course. The course cutline is included as Attachment A to Item 8. This course is presently a 10 hour video tape course presented by Harry Howe. In 1986, Howe's course was taped due to his change of job location to Lawrence Livermore Laboratory. Included as Attachment B to Item 8 is a resume of H. Howe's qualifications through 1986. Dr. Brucker now conducts the course and tests the attendees at the completion (see Attachment C, Item 7 for his resume).

For personnel who use the Gammacell-220 an additional instruction session is added to the radiation protection training course addressing the use of this irradiator. This training includes operating procedures, emergency procedures, the irradiator manufacture's manual, especially the safety design features of the machine, and finally the all important practical hands-on experience of all potential operators. This experience is directed to the special application of testing and characterizing the properties of materials and semiconductor devices. It includes actual experiments to measure the radiation properties of a semiconductor test device. Dr. George Brucker provides this half-day training. Competency of any candidate operator is judged by Dr. Brucker who administers a written examination and practical hands-on demonstration by the candidate of his capability to operate the irradiator. A copy of the written test with answers is given as Attachment C to Item 8.

The attendance records of personnel who attend the Radiation Protection Course are kept along with test scores. The passing score is 70%. The tests of personnel who fail to receive this minimum score are reviewed by the instructor to determine the general topical areas which were deficient. Additional instruction in these areas is given and a different test, which cover all topics is administered.

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RADIATION PROTECTION TRAINING COURSE OUTLINE

LECTURE DURATION

I. PRINCIPLES OF RADIATION — 2 Hours

1. Introduction

   a. States of Matter
   b. Elements
   c. Atoms
   d. Size, Mass, Density
   e. Model, Energy Levels
   f. Forces
   g. Isotopes

2. Radiation as Energy

   a. Types of Radiation Energy
   b. Particles
   c. Wave

3. Radioactivity and Radioactive Decay

   a. Early History
   b. Basic Theory
   c. Radioactive Series
   d. Radioactive Decay
   e. Chart of the Nuclides

4. Properties and Interactions with Matter

   a. Alpha Particles
   b. Beta Particles
   c. X-Rays and Gamma Rays
   d. Neutrons

5. Summary

II. MEASUREMENT OF RADIATION — 2 Hours

1. Introduction

2. Detection Principles

   a. Gas Filled Chambers
   b. Semiconductor Devices
   c. Scintillation Devices
   d. Chemical Devices
   e. Solid State Devices
   f. Activation Devices

RADIATION PROTECTION TRAINING COURSE OUTLINE (Cont'd)

LECTURE DURATION

3. Quantification

   a. Mean Level System
   b. Pulse Counters
   c. Count Rate Meters
   d. Counter Plateau
   e. Pulse Height Analysis
   f. Qualifiers

4. Instrumentation

   a. Dosimetry
   b. Survey Instruments
   c. Analysis

5. Personnel Monitoring

   a. Film Dosimeters
   b. Pocket Dosimeters
   c. Thermoluminescent Dosimeters
   d. Accident Dosimetry

6. Area Monitoring

   a. External Fields
   b. Contamination
   c. Air Sampling
   d. Liquid Samples

7. Environmental Monitoring

III. QUANTITIES, UNITS AND STANDARDS — 2 Hours

1. Quantities and Units

   a. Activity
   b. Exposure
   c. Absorbed Dose
   d. Dose Equivalent
   e. Quality Factor
   f. Exposure Rate
   g. Absorbed Dose Rate; Gamma Point Source
   h. Relationship of Exposure to Absorbed Dose Rate
   i. Absorbed Dose Rate, Point Source, Alpha/Beta

RADIATION PROTECTION TRAINING COURSE OUTLINE (Cont'd)

LECTURE DURATION

2. Standards for Radiation Protection

   a. Historical Derivations
   b. Regulatory Agencies

3. Comparisons

   a. Natural Radioactivity in the Environment
   b. Manmade Radiation
   c. Medical Radiation
   d. Other Risks of Daily Life

IV. BIOLOGICAL EFFECTS — 2 Hours

1. Introductory Concepts

   a. Human Body; The Cell
   b. Radiosensitivity
   c. Radiation Effects

      1. Early Somatic Effects
      2. Late Somatic Effects
      3. Genetic Effects

V. DOSE ESTIMATES AND PROTECTIVE TECHNIQUES — 2 Hours

1. Dose Estimate

   a. External Exposure
   b. Internal Exposure

2. Protective Techniques

   a. Shielding
   b. Distance
   c. Time
   d. Contamination Control

RESUME

Harry J. Howe, Jr.

Harry J. Howe, Jr. is the Manager of the Health and Safety Branch of the Princeton Plasma Physics Laboratory (PPPL).

Mr. Howe joined PPPL as Manager of the Health and Safety Branch in 1975. Prior to joining PPPL he was Manager of the Health Physics Section at Argonne National Laboratory (1974-1975). He also was Manager of the Health and Safety Branch of the Accelerator Division at Fermi National Accelerator Laboratory from 1970-1974. From 1965-1970 Mr. Howe was a health physicist at the ZGS Synchrotron facility at Argonne National Laboratory. Mr. Howe has over 16 years of experience in accelerator and nuclear reactor safety and radiation protection. As manager of PPPL's Health and Safety Branch, Mr. Howe has been actively involved in the Princeton Large Torus (PLT) and Poloidal Divertor (PDX) Experiments and the Tokamak Fusion Test Reactor (TFTR) Project.

He received a Master of Science degree in Physics from Vanderbilt University in 1965 under the AEC Health Physics Fellowship program and a Bachelor of Science degree from Texas Western College in 1963. Mr. Howe is a member of the U.S. DOE Advisory Panel on Accelerator Radiation Safety (APARS) and the Health Physics Society.

SAMPLE
OPERATOR'S TEST

1) Calculate the dose rate in rads per hour that is to be expected for a 1 curie point source of Cobalt-60 at a distance of 1 foot from the source. How far away from the source must you be in order to be exposed to 1 millirad per hour?

What lead thickness is required to allow a man to stand 1 foot away from the source in the above problem behind the lead shield?

2) Given that the half life of Cobalt-60 is 5.27 years compute the length of time after receiving the source when the intensity would have decreased by 20%, leaving 80% of the original value.

3) How would you determine with the help of a radiation detector, capable of detecting α, β and gamma radiation, whether an unknown radioactive source was a gamma emitter? Select the best answer.

A) Shield source from detector with a sheet of paper and measure dose rate, compared to a measurement with no paper.

B) Shield source from detector with two inches of lead and measure dose rate, compared to a measurement with no lead.

C) Shield source from detector with a sheet of paper, measure rate then with 1/2 inch of Lucite and measure rate, compared to a measurement with no shields.

D) Simply measure dose rate without any shields.

4) Define the following radiation units, rad (SI) and Roentgen.

5) Answer true of false:

A) Devices or materials increase in temperature when irradiated by any source.

B) Beta particles are less penetrating than gamma rays.

C) The shielding thickness of lead equivalent to aluminum is approximately a factor of 1/10 that of the aluminum thickness.

6) Select best answer:

1) In case of power failure in Gammacell-220,

A) Call the NRC.

B) Manually raise the source under supervision of radiation protection officer.

C) Call the local power company.

2) In case of excessive dose rate readings in the radiation facility,

A) Notify the local police.

B) Notify plant engineering

C) Leave and lock facility, notifying the radiation safety officer of the situation.

7) The distribution of intensity within the gamma cell exposure chamber increases in a radial direction from the center and decreases in a vertical direction, up or down from the center. Answer the following statements true or false.

A) For a cylindrical exposure fixture, exposure times for a given device must be decreased.

B) Devices in sockets arranged on the circumference of a cylindrical fixture and at the top of the exposure chamber will be exposed to a lower dose than those at the bottom.

C) The dose rate at the center of the chamber corresponds to the calibration dose rate provided by the manufacturer corrected by the decay factor.

D) The dose rate at the center of the chamber is given in rads(water) thus a correction must be made to convert to rads (SI).

8) If a radioactive source loses 25% of its activity in 5 hours what is the half life of the source?

9) Assume that a radiation detector correctly measure the number of disintegrations/sec as equal to 3.7E7 close to a Cobalt-60 source. Compute the source strength in curies and the dose rate in rads(SI)/hour 10 feet away. For what source strength would the dose rate be equal to the allowed federal rate of 2 millirads/hour?

10) What is the largest accumulated whole body dose of radiation that a 21 year old radiation worker would be allowed to receive according to the radiation protection guidelines?

11). If a radiation leak and contamination is suspected, what should be done to determine this fact?

12) How should a radioactive sample be handled?

13) Are there periodic checks that should be done in storage areas for radioactive sources?

14) Name the four main types of radiation which must be dealt within health physics? What two radiations may be considered as one?

15) What name is defined by the average energy required to create an ion pair in a given substance? What is it for silicon and air?

16) What term indicates distance that a radiation particle will travel?

17) Upon what does the highest energy of X-ray produced by an X-ray tube depend?

18) Why are X-rays more dangerous than α-particles?

ANSWERS
Sample Operators Test

1. a) 1 m rad/hr at 122.5 ft.
   (based on 15 rads/hr at 1 ft.)
   b) 14.9 cm lead
2. 1.70 years
3. C
4. Rads(Si) - Radiation Absorbed Dose. A unit of absorbed energy equal to 100 ergs absorbed by 1 gram of silicon.
   Roentgen - Unit of exposure dose of X-ray or gamma ray which produces charge/unit mass of standard air equal to 2.58×10^{-4} Coulombs/kilogram.
5. a) T b) F c) F
6. (1) B (2) C
7. a) T b) F c) T d) T
8. 12 hrs.
9. a) 1m Ci
   b) 0.13 m Rads(Si) at 10ft.
   c) 15 mCi at 10 ft.
10. 15 rem
11. Perform a wipe test
12. with gloves and/or tongs
13. yes
14. a) X-ray, gamma ray, alpha, beta, neutrons
    b) X-ray and gamma rays
15. a) ionization energy
    b) 35 eV/ion pair in air
       3.6 eV/ion pair in Silicon
16. range
17. operating voltage of the x-ray tube.
18. X-ray have longer ranges than alpha-particles.

FACILITIES AND EQUIPMENT

a) Facility

The source (Gammacell 220 Research Irradiation) is housed in Building 407 (see Attachment A, Item 9). This facility, constructed with concrete blocks, has a double lock, is isolated from all other work areas, and has a security fence around it. Access to the radiation facility will be limited to authorized personnel controlled by the Radiation Protection Officer.

b) Equipment

Permanently located in Building 407 is a VAMP area monitor (Victoreen Model 808D) and is used for continuously monitoring radiation from the source.

Item 9
Attachment A
NRC Form 313

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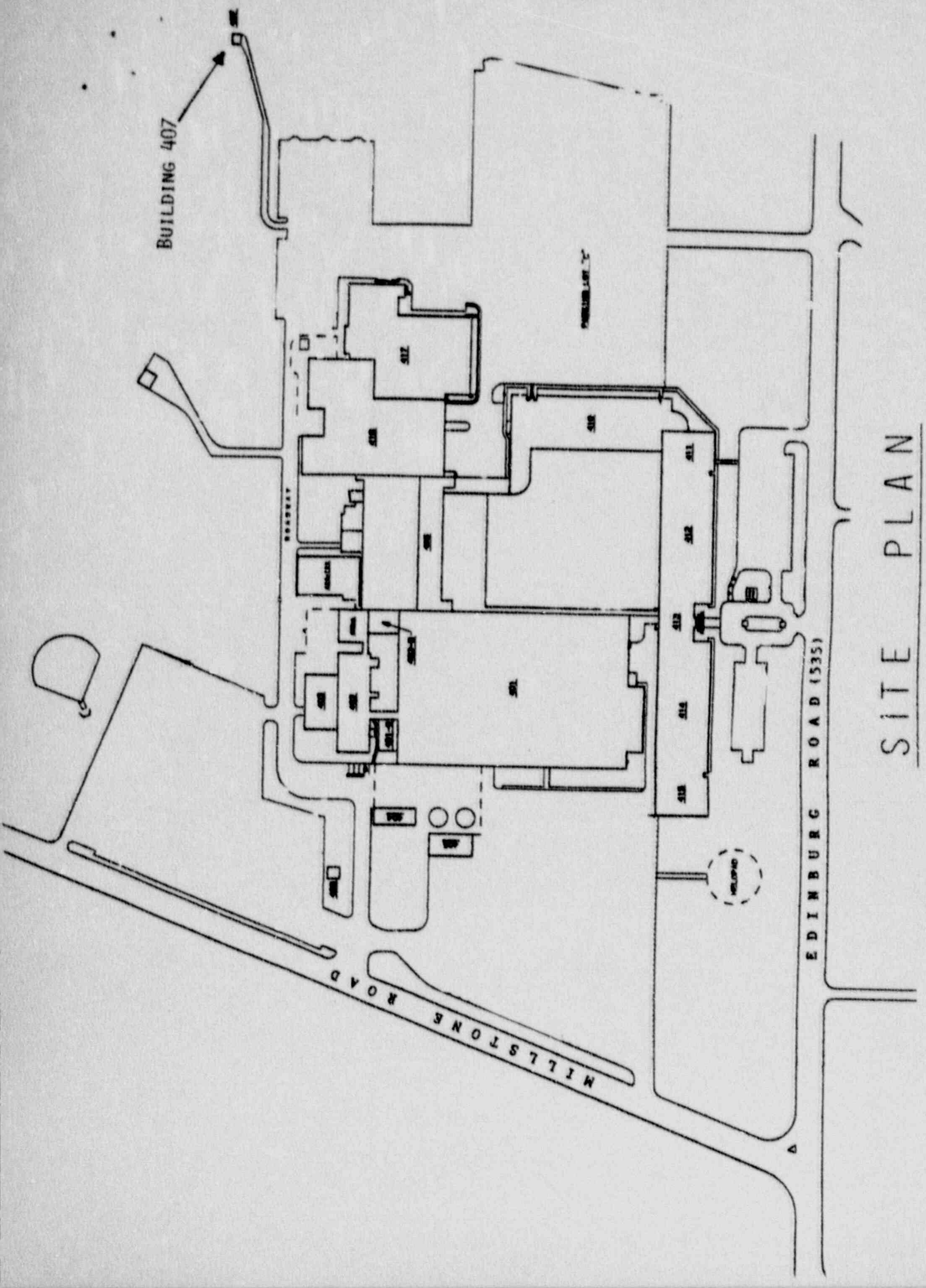

I. RADIATION SAFETY PROGRAM

This is in response to Item 10 of the subject application for license renewal. It is intended to provide a brief description of GE Astro-Space Division's (EW) radiation protection program.

II. REFERENCE PROCEDURES

GE Corporation, formerly RCA Corporation and Astro-Space Division Policies, Procedures, and Operating Instructions covering accident prevention and the handling of hazardous materials are as follows:

Policy 24200 (B-961)	RCA Policy, Accident Prevention and Compliance with Safety Regulation B-961.
GSD Procedure 0810	GSD Disaster Control Program
Astro Operating Instruction P0810	Astro Disaster Control Program Instruction
GSD Procedure 5400	GSD OSHA Program
GSD Procedure 0201	Procuring and Handling Radioactive Materials and Other Radiation Producing Sources
Astro Operating Instruction P0201	Control of Radioactive Materials Other Radiation Procuring Sources
GSD Procedure 5513	Safety Precautions, Radiation
Astro Operating Instruction P8030	Product Safety Program

III. RADIATION PROTECTION OFFICER(S), DUTIES AND RESPONSIBILITIES

GE Astro-Space Division (EW) management has delegated authority for the control of the radioactive materials as follows:

Radiation Protection Officer*

Mr. Surinder Seehra, Manager, Physical Effects Group

Mr. Seehra is responsible for the administrative and control aspects of the programs, i.e., licensing requirements, storage and inventory control, approving (where necessary) handling procedures and practices, providing expert advice to potential users, access authorization, enforcement of controls, audits and records.

Radiation Protection Officer, Assistant*

Mr. Lester Jung

Mr. Jung has technical cognizance of the Astro radiation protection program. Mr. Jung provides administrative assistance and performs duties delineated by the Radiation Protection Officer, e.g., monitoring that the personnel allowed to use sources are competent, providing expert advice to potential users, recommending handling procedures and practices, verifying safety of packaging and sources prior to allowing entry into the Astro control system and is immediately available to respond to questions or problems associated with radioactive materials.

*NOTE: The Radiation Protection Officer has been referred to as the Radiation Health Officer within internal policies since the 1960's. Although the title is different, the Radiation Health Officer position is synonymous with the Radiation Protection Officer position.

Item 10.1
• NRC Form 313

IV. GENERAL DESCRIPTION OF PROGRAM

a) Receipt

All radioactive materials or devices are surveyed by Radiation Protection and Personnel Safety officials prior to their introduction into the plant and entry into the control system. The Receiving function places such material shipments into a personnel isolated, locked, and marked, steel cabinet in the container as received from the shipper. The survey is performed at that location as soon after receipt as possible. Where applicable, current leak test certification is verified, and an initial leak test (by Astro) is performed at the point of entry into the control system.

b) Storage and Use Control

The source (Gammacell 220 Research Irradiator) is housed in Astro Building 407. This facility, constructed with concrete blocks, has a double lock, is isolated from all other work areas, and has a security fence surrounding it. Access to the radiation facility will be limited to authorized personnel controlled by the Radiation Protection Office.

The room itself will contain a user's data log, a posted caution sign, "Caution, Radioactive Material", a VAMP area monitor (Model 808D) for continuously monitoring radiations from the source, and a survey meter (Model 470A) for accurately measuring radiations at various places within the room.

The area monitor is located on a bench, facing the sample chamber, about one meter away from the irradiator surface. The portable survey meter is used to (i) check area monitor's reading, and (ii) measure radiation dose rates at critical locations in and around the irradiator (e.g., sample chamber, etc.). The survey meter will be kept at the radiation facility.

c) Personnel Precautions/Monitoring

All personnel using the source are adequately trained (attended or will attend a Radiation Protection Training Course, outline of the course is shown in Item 8) commensurate with the activity to be performed. Personnel badges are assigned to all such personnel, and must be worn at all times during their stay in the radiation facility. All badges are Searle Analytic and are check monthly.

d) Use of Source

The use of Gammacell 220 Research Irradiator in irradiating devices and materials is defined by written procedures tailored for the specific material and intended use.

e) Recall System

GE enters all radioactive sources, instruments containing such sources, and associated survey instruments into the computerized calibration system.

This system automatically flags pending calibration due dates, leak test required dates, the results of such actions, and the responsible person. Any failure to comply with calibration or leak test requirements is immediately evident to management and action is taken to complete the open item.

f) Signs/Warnings

All areas where radioactive materials are stored or used are posted with appropriate warning signs.

g) Audit of the control system is performed periodically as part of the Astro audit program by Quality Engineering personnel.

RADIATION DETECTION INSTRUMENTS

The irradiator facility, described in Item 9, has an area monitor used for continuous monitoring. In addition to the area monitor a survey instrument, which can measure up to 1R/hour is kept in the lab. These instruments are calibrated on a quarterly basis. The schedule of calibration is maintained by our in-house computerized system. The department which schedules calibration also maintains the records of calibration for over 2 years. The calibration is done with a Cs-137 source and is performed by:

Nuclear Instrument Company
65 Grove Street
Rockland, MA

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LEAK TESTING

Wipe Tests

The Astro control system requires that a leak test of all sealed sources be kept current (6 months intervals). Records of leak test results are maintained by the Radiation Protection Office and are reported to the computerized calibration recall system.

1) Primary Method

   Wipe tests will be performed by D. B. Howell of Rutgers University (Radiation Health Physics Consultant) once every six months. The procedure to be followed is given below:

   1) The surface of the sealed sources will be wiped with absorbent Whatman filter paper circle(s) dampened with water.

   2) The wipe sample will be analyzed with a Beckman LSC-133 in the open beta window mode.

   3) Wipe test results will be reported in μCi.

2) Back Up Method

   Wipe test kits (Type QT-1) supplied by Siemens Gammasonics, Inc., are used together with their analysis service. Result will be reported in μCi.

OPERATING AND EMERGENCY PROCEDURES

Step-By-Step Operating Procedure for the Gammacell 220

1. Unlock the door of the radiation facility and check the radiation level on the area monitor located about one meter away from the front of the irradiator. If the level is within acceptable limits ($\leq$10 mR/Hr.) follow the operating procedure given below to irradiate the required material or devices. If, however, the level indicated by the area monitor is higher than 10 mR/Hr., follow the emergency procedure given in Section (B).

2. Insert the key into the keyswitch and turn to ON.

3. If the drawer is down, press the UP portion of the rocker switch.

4. Open the collar by depressing the latch behind the right handle while pressing the collar interlock button.

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

6. Place the fixture containing materials or semiconductor devices to be irradiated in the chamber. If bias is required on the devices during irradiation, connect electrical leads to the fixture through the access tube in the drawer top. Close the top shielding plug after inserting the electrical leads. Set the desired bias voltage.

7. 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.

8. Close the left collar door first, then close the right one making sure it latches in position.

9. Set the required irradiation time on the digital timer in the following manner:

(a) Press the timer reset button to repeat the previous setting.

(b) Press and hold in the timer reset button while changing to the desired setting by pressing the individual digit buttons until the correct setting is reached.

(c) Release the timer release button.

10. Select the timing mode either SECONDS or MINUTES.

11. Press the DOWN portion of the rocker switch. The drawer will lower to the irradiate position, activate the timer, and remain there until the preset time interval has elapsed, when it will automatically rise.

12. To remove the sample fixture, repeat steps 4 and 5.

13. If needed, the drawer can be raised during irradiation by pressing the UP portion of the rocker switch. The balance of the irradiation time will remain on the timer.

MANUAL OPERATION

14. For initial set-up read steps 2 - 8.

15. Rotate the selector switch to MANUAL.

16. Press the DOWN portion of the rocker switch. The drawer will lower and remain there indefinitely until the UP portion of the rocker switch is operated.

(B) EMERGENCY PROCEDURES

1. Power Failure: In the event of a power failure the timer will stop and it will be necessary to raise the drawer manually. Inform the Radiation Protection Officer/Associate Radiation Protection Officer and follow the operating procedure given below under his supervision.

(a) Turn the keyswitch to the OFF position.

(b) Spring out the large round button near the lower right-hand corner of the back cover.

(c) Push the crank through the hole until it snaps into the extension on the input shaft of the reducer.

(d) Crank in a clockwise direction to raise the drawer. Hand crank operation is made easier if the V-belt is removed from the drive as the motor is equipped with a brake. It is necessary to remove the rear cover for access to the drive system.

2. Excessive Leakage: If upon entering the radiation facility, housing the irradiator, the area monitor and the portable survey meter indicate at a distance of one meter from the irradiator surface, a dose rate higher than 10 mR/Hr. follow the procedure given below.

(a) Leave the room with the portable survey meter and lock it.

(b) Notify the Radiation Protection Officer/Assistant Radiation Protection Officer (Ext. 2972/2132).

(c) The Radiation Protection Officer/Assistant Radiation Protection Officer will ascertain if the radiation survey meter is accurately measuring the dose-rate in the radiation facility. If he verifies the accuracy of the survey meter (>10 mR/Hr. at 1 meter), he will notify the Atomic Energy of Canada Ltd. (the manufacturer of the source) and the U.S. Nuclear Regulatory Commission Region 1 of the situation and act according to their recommendations. In the meantime, guards will be posted at a safe distance from the building who will prevent personnel from entering the radiation facility.

3. Fire: In case of fire, immediately notify the Plant Fire Marshal (by dialing emergency #123 or Ext. 2153) and the Radiation Protection Officer/Assistant Radiation Protection Officer (Ext. 2972/2132). The Fire Marshal will notify the local Fire Department and inform them of the hazardous nature of the materials in the building. At the same time the Radiation Protection Officer/Assistant Radiation Protection Officer will notify the Atomic Energy of Canada Ltd. and, if needed, the U.S. Nuclear Regulatory Commission Region 1 and act according to their recommendations.

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WASTE MANAGEMENT

Removal, replacement, and disposal of sealed sources will be performed by:

Atomic Energy of Canada, LTD.
P.O. Box 6300
Ottawa, Canada K2A 3W3

BETWEEN:

LICENSE FEE MANAGEMENT BRANCH, ARM
AND
REGIONAL LICENSING SECTIONS

(FOR LFMS USE)
INFORMATION FROM LTS

PROGRAM CODE: 03520
STATUS CODE: 0
FEE CATEGORY: 3E
EXP. DATE: 19881130
FEE COMMENTS:

NOTE: Licensee Name exp "GE Astrospace Division"

LICENSE FEE TRANSMITTAL

A. REGION I

1. APPLICATION ATTACHED
   APPLICANT/LICENSEE: ~~RCA ASTRO-ELECTRONIS~~
   RECEIVED DATE: 881028
   DOCKET NO: 3020795
   CONTROL NO.: 109784
   LICENSE NO.: 29-00651-04
   ACTION TYPE: RENEWAL

2. FEE ATTACHED
   AMOUNT: $170.00
   CHECK NO.: JD6957

3. COMMENTS

SIGNED EMW
DATE Nov 2, 1988

B. LICENSE FEE MANAGEMENT BRANCH (CHECK WHEN MILESTONE 03 IS ENTERED / ✓)

1. FEE CATEGORY AND AMOUNT: 3E $170

2. CORRECT FEE PAID. APPLICATION MAY BE PROCESSED FOR:
   AMENDMENT
   RENEWAL ✓
   LICENSE

3. OTHER

SIGNED S Kimberley
DATE 11/22/88