

FORM NRC-313 I (3-80) 10 CFR 30		U.S. NUCLEAR REGULATORY COMMISSION  1. APPLICATION FOR: (Check one or complete as appropriate) <div style="text-align: center; border: 1px solid black; border-radius: 50%; padding: 10px; width: 100px; margin: 10px auto;">             AUG 02 1982              NEW ENGLAND NUCLEAR REGULATORY           </div> 2. AMENDMENT TO LICENSE NUMBER 3. RENEWAL OF LICENSE NUMBER X 20-17594-01		
<b>APPLICATION FOR BYPRODUCT MATERIAL LICENSE INDUSTRIAL</b>				
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.				
2. APPLICANT'S NAME (Institution, firm, person, etc.)  J. G. Sylvester Associates  TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION 617-878-9000		3. NAME AND TITLE OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION  Dennis Yeaton  TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION 617-878-9000		
4. APPLICANT'S MAILING ADDRESS (Include Zip Code) (Address to which NRC correspondence, notices, bulletins, etc., should be sent.)  900 Hingham Street Rockland, MA 02370		5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED (Include Zip Code)  900 Hingham Street Rockland, MA 02370		
(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. Frank L. Clifford		Radiation Safety Officer		
b. Dennis C. Yeaton		Asst. Rad. Safety Officer		
c.				
7. RADIATION PROTECTION OFFICER  Frank L. Clifford		Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.  Submitted 10-10-79		
<b>8. LICENSED MATERIAL</b>				
LINE NO.	ELEMENT AND MASS NUMBER	CHEMICAL AND/OR PHYSICAL FORM	NAME OF MANUFACTURER AND MODEL NUMBER (If Sealed Source)	MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME
(1)	See Supplement		Date: 8/4/82 Loc: 613 E: Brown Date: 8/4/82	
(2)	2501			
(3)	Renewal			
(4)	8/4/82			
DESCRIBE USE OF LICENSED MATERIAL E				
(1)	See Supplement			
(2)				
(3)	8508090105 850522 PDR FOIA BROWN85-318 PDR			
(4)				

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## 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)	N/A	- -	
(2)			
(3)			
(4)			

## 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)	Survey Myter	Victoreen	492	4	Gamma	0-1000 MR/HR
(2)	Count Rate Myter	Victoreen	495	1	Beta, Gamma	0-500,000 CPM
(3)	Scintillation Detector	TracerLab	P-12A	1	Alpha	CPM
(4)	Gamma Alarm	Victoreen	808 D	1	Gamma	0-100 MR/HR

## 11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☐ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

See Supplement

☐ 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.
<input checked="" type="checkbox"/> (1) FILM BADGE <input type="checkbox"/> (2) THERMOLUMINESCENCE DOSIMETER (TLD) <input type="checkbox"/> (3) OTHER (Specify): _____ _____ _____	R. S. Landauer, JR & Co. Glenwood, Illinois 60425	<input checked="" type="checkbox"/> MONTHLY <input type="checkbox"/> QUARTERLY <input type="checkbox"/> OTHER (Specify): _____ _____ _____

## 13. FACILITIES AND EQUIPMENT (Check where 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.

## 14. WASTE DISPOSAL

a NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

Interex, 3 Strathmore Road, Natick, MA 01760

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.

# 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.

## 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) <i>Dennis C. Yeaton</i>
(1) LICENSE FEE CATEGORY: 3, L	c. NAME (Type or print) Dennis C. Yeaton
(2) LICENSE FEE ENCLOSED: \$ 110	d. TITLE General Manager
	e. DATE July 16, 1982



**J. G. Sylvester Associates, Incorporated**  
Metallurgical and Welding Consultants  
Materials Testing

900 Hingham Street • Post Office Box H • Rockland, Massachusetts 02370-0607 • Telephone 617-878-9000

Supplement to NRC-313 I

Item: 8

<u>Element and Mass No.</u>	<u>Chemical and/or Physical Form</u>	<u>Name of Manufacturer</u>	<u>Maximum Millicuries to be possessed at one time</u>
<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>
A/Atomic Nos. 3-83 Inclusive	A/Any-Irradiated Specimens	A/Not Applicable	A/Not to exceed 5 Millicuries per Nuclide. Total Milli- curies 100.
B/Chromium-51	B/Any	B/ NA	B/10 Millicuries
C/Magnesium-54	C/Any	C/ NA	C/10 Millicuries
D/Iron-55	D/Any	D/ NA	D/10 Millicuries
E/Iron-59	E/Any	E/ NA	E/10 Millicuries
F/Nickle-63	F/Any	F/ NA	F/10 Millicuries
G/Cobalt-58	G/Any	G/ NA	G/10 Millicuries
H/Cobalt-60	H/Any	H/ NA	H/100 Millicuries

E. Authorized use (A through H):

Preparation and analysis of reactor components subjected to  
irradiation and/or radioactive contamination.

Item: ~~10~~<sup>11</sup>(a)

F. L. Clifford  
Box 452  
Niantic, LT 06357

Nuclear Instrument Co.  
65 Grove Street  
Rockland, MA 02370

# J. G. SYLVESTER ASSOCIATES, INC.

METALLURGICAL AND WELDING CONSULTANTS  
MATERIALS TESTING - METALLURGICAL LABORATORIES  
INDUSTRIAL RADIOGRAPHY  
FIELD INSPECTION  
NDE

OFFICES AND LABORATORIES AT:  
900 HINGHAM STREET  
POST OFFICE BOX H  
ROCKLAND, MASS. 02370

TELEPHONE  
617-878-9000  
TWX 710-346-1793

## RADIATION PROTECTION PROGRAM

### General

The radiation protection program at J. G. Sylvester Associates, Inc. for the specific use of open source byproduct material for metallurgical, failure analysis, and non-destructive examination shall consist of four discrete sections.

Section I shall embody responsibility for control of byproduct material and personnel qualifications of the individuals charged with this control.

Section II shall consist of a course in Health Physics as related to our specific work requirements; and in direct compliance with Title 10, Chapter 1, Code of Federal Regulations; NRC, Parts 19, 20, 30, and 31.

Section III will consist of a detailed policy statement regarding all work performed in our Hot Lab, mandatory requirements for Hot Lab personnel, and emergency decontamination procedures, as well as a description of permanent Hot Lab facilities. Section III will also be explained and read by all personnel taking the Health Physics course.

Section IV will consist of our routine policy for Hot Lab inspection, air sampling, swipe testing and hood exhaust monitoring.

### Section I

1. The following persons are directly responsible for overall radiation protection in the use of byproduct material by J. G. Sylvester Associates, Inc.
  - (1) Dennis C. Yeaton, General Manager and Assistant Radiation Safety Officer.
  - (2) Frank Clifford, Radiation Safety Officer.

Mr. Yeaton is the General Manager of the corporation and shall be responsible for the overall operation of the radiation protection program.



Mr. Frank Clifford has been retained to act as Radiation Safety Officer for hot laboratory operations. All hot lab operations will be conducted under the direct control and SURVEILLANCE of Mr. Clifford with the following exceptions:

- (a) Materials may be received, surveyed and stored in our Hot Lab by the following persons.

Dennis C. Yeaton

It shall be required, however, that these materials remain packaged and unopened until Mr. Clifford is physically on the premises, who can then supervise and control the opening, surveying and handling of these materials.

- (b) After these materials have been packaged for shipment and properly surveyed by Mr. Clifford, they may be stored or shipped by Mr. Yeaton.

- 2. Authority to issue or change operating procedures involving safety and disposition of radioactive material is vested Radiation Safety Officer.

#### Qualifications of Radiation Safety Personnel

##### Assistant Radiation Safety Officer

Mr. Yeaton has over nine years experience as an industrial radiographer with J. G. Sylvester Associates, Inc. and he is presently General Manager of the corporation. He has also studied and been given radiation safety training pertinent to industrial radiography in excess of 120 hours. He has also studied and been given 40 hours of intensely specialized training in handling open source materials, radioactive waste disposition, health physics control procedures in a radiological environment, and mathematical calculations basic to the use and measurement of radioactivity.

Health Physics Course for Open Source Byproduct Material

The training required for the personnel who work in the Hot Lab shall consist of first, satisfactory completion of the health physics course for radiographers which is part of USNRC Materials License No. 20-00302-02 (included as attachment #1 of this document) and second, the satisfactory completion of the following training course:

- I. Contamination Control
  - a. Surface contamination
  - b. Airborne contamination
  - c. Protective clothing.
  - d. Frisking
  - e. Swipe tests and measurement.
  - f. Airborne sampling and measurement.
  - g. Removal of contamination.
  - h. Control of spills.
  - i. Waste disposal.
- II Laboratory Operational and Emergency Procedures
  - a. Work permits.
  - b. Air filtration.
  - c. Alarms and instrumentation
  - d. Emergency instructions.

Section IIIHealth Physics Regulations

The hot lab will be considered "hot" whenever any open byproduct material is in the lab. Once byproduct material has been opened, the lab shall be considered hot until the following surveys and operations are completed and audited by the Radiation Safety Officer.

1. All open byproduct material resealed in plastic containers or drums.
2. All hot lab surfaces are cleaned and swipe surveys indicate no contamination levels in excess of  $.01 \text{ uCi}/100\text{cm}^2$ .
3. No areas exist which if any individual were continuously present in the area, could result in his receiving a dose in excess of 2 millirems in any one hour or 100 millirems in any seven consecutive days.
4. Hood exhaust filters, both particulate and charcoal, are monitored individually and when a survey indicated a level of radiation greater than 100 cpm above background the filters will be replaced.

When the lab is hot, the following regulations shall be in force to prevent exposure or contamination of hot lab workers, the general public and the environment.

1. There will be no mouth operations, specifically no mouth pipetting, eating, smoking, drinking or chewing gum or candy.
2. Personnel will change street clothing, as required by work permit before entering the hot lab.

3. Personnel monitoring devices may be worn under coveralls, except for wrist badges and finger rings which will be covered by gloves when specified by the work permit.
4. Before entering the hot lab, the exhaust blower for the hooded areas will be placed on high speed.
5. No less than two individuals will be permitted to work in the hot lab or one individual may work in the hot lab provided an intercom is monitored and there are at least two individuals on the premises.
6. Anyone who has an open wound of any kind must check with the Radiation Safety Officer to determine whether any special precautions are necessary.
7. A radiation work permit must be obtained from the Radiation Safety Officer, before access to the hot lab is granted.
8. Any injury in the hot lab must be reported at once to the Radiation Safety Officer. If the injury is of minor nature, work will be allowed to continue at the discretion of the Radiation Safety Officer, however should it be serious in nature, written approval from the corporate physician must be obtained prior to returning to work. In the event of a serious injury, the co-worker will aid the injured to the access room and immediately summon assistance via the intercom, describing the nature and the extent of the injury. In such a case normal decontamination procedures may be abandoned, the life of the injured will take priority; however a co-worker may institute decontamination procedures while awaiting the ambulance. After the injured has been removed, the co-worker shall monitor all equipment, floors, benches, himself as well as the access area for contamination. He will then report to the Radiation Safety Office and write a detailed summary of the incident. No further work will be permitted in the hot lab until the cause of the accident is determined and eliminated.
9. Upon leaving the hot lab all personnel shall monitor themselves; hands, forearms, body and feet. All protective clothing shall be removed and put into hot waste drums. If after removing protective clothing, contamination is still present, the contaminated areas will be washed and scrubbed until the contamination is removed.
10. Upon leaving the access area, all personnel will remonitor themselves as a double check paying particular attention to hands and feet.
11. When personnel have assured themselves that they are "cold", they will close and secure hot lab door. They will also return the hood exhaust blower to normal speed.
12. All monitors, alarm systems, and the exhaust blower shall be left on 24 hours per day, while cell is hot (open by-products in lab).
13. All liquid hot waste shall be poured into 1 gallon plastic bottles filled with "floor dry" or some other absorbent if approved by the Radiation Safety Officer. When these bottles are filled (the absorbent material is saturated) they will be capped off with their twist tight plastic top and placed



- individually inside a 3 mil. thick plastic bag whose top will then be secured. At this point they may be placed into the hot waste drum.
14. All hot waste drums must be lined with a 6 mil. thick plastic bag.
  15. When a hot waste drum is full the liner will be sealed with wire and before the cover is locked on, the barrel must be swipe tested over its entire surface to check for removable contamination. Following this, a survey meter must be placed in contact with the sides and top of the barrel to check that it is no more than 2 mR/hr at these contact points. Should the level be in excess of 2 mR/hr the drum must be stored in a locked and posted storage area.
  16. A yellow tag, indicating the isotope (s), amounts and date is then taped to the barrel top.
  17. The barrel may now be removed from the hot lab to the storage area for pickup by Interex Corporation or other NRC licensed disposal services.
  18. All hot lab personnel shall have their film badges read monthly.
  19. A Dosimeter log shall also be maintained in which all hot lab personnel shall record their dosimeter reading at the end of each work day. Dosimeters shall be recharged at the commencement of each work day.
  20. All hot lab personnel are required to undergo physical examinations administered by the corporate physician once a year.
  21. The corporate physician may institute any additional tests and bio-assay procedures that he deems necessary and appropriate.
  22. An air quality sampling log shall be maintained by the Radiation Safety Officer, in which records of routine hood exhaust filter changes, and air quality particulate filter assays will be recorded as specified in Section IV.
  23. Radiation work permits must be turned into the Radiation Safety Officer immediately upon completion of each analysis. Sample A2 "Radiation Work Permit" is on the following page.
  24. Procedures for Receiving, Opening Packages, and Shipping Packages Containing Radioactive Materials:
    - A. Upon notification by the carrier, all incoming packages will be inspected as soon as practicable, but no later than three hours upon arrival from the carrier. Specifically the Radiation Safety Officer, or designate, will monitor all the surfaces of the package for leakage, furthermore, the package will be swipe surveyed over the surface of at least 100 Cm<sup>2</sup> to check for contamination. These monitoring procedures must be performed and entered in the Material Inventory Log within three hours after receipt of the package. If the package arrives after normal working hours the Radiation Safety Officer must be notified immediately and the monitoring proce-

If there should be removable contamination in excess of .01 microcuries (22,000 dpm) per 100 cm<sup>2</sup>; or if the radiation levels are found on the external surface of the package in excess of 200 mr/hr or at three feet from the external surfaces of the package in excess of 10 mr/hr, the Radiation Safety Officer shall immediately notify the final delivery carrier and by telephone, telegram or mailgram notifying the Nuclear Regulatory Commission Inspection and Enforcement Regional Office at 215-337-1150, daytime, nights and holidays, address:

Region I  
USNRC Office of Inspection and Enforcement  
631 Park Avenue  
King of Prussia, Pa. 19406

- B. Once these initial surveys are made and logged in, the packaged may be brought into the hot lab where one individual will carefully remove the packed radioactive material, while a second individual will monitor both the radioactive material as well as the shipping containers for contamination. This procedure will be observed by the Radiation Safety Officer to insure compliance with Health Physics Regulations. Any contaminated packing material will be disposed of as radioactive waste.
- C. In preparing radioactive material for shipment, it will be package in accordance with current D-O-T regulations. The shipping container will be sealed and monitored to insure there is no removable contamination in excess of .01 microcuries (22,000dpm) per 100 cm<sup>2</sup> or external radiation levels in excess of 200 mr/hr at contact and 10 mr/hr at a distance of 3 feet from any external surface. Required D-O-T labels will be affixed to each side of the shipping containers indicating the isotope, number of curies and transport index. Only after this information is recorded in the material inventory log may the material be shipped.

RADIATION WORK PERMIT**A. Required Information:**

1. Person (s) to Whom Issued: \_\_\_\_\_
2. Date: \_\_\_\_\_
3. J.G.S. Job Number: \_\_\_\_\_
4. Expected Duration of Analysis: \_\_\_\_\_
5. Approximate Level of Radioactivity to be Handled: \_\_\_\_\_
6. Expected Isotope (s) to be Handled: \_\_\_\_\_
7. Special Safety Precautions: \_\_\_\_\_
8. Type of Analysis Requested: \_\_\_\_\_
9. Special Equipment Needed if any: \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
Radiation Safety Officer\_\_\_\_\_  
Assistant Radiation Safety Officer**B. Operational Check List**

1. Personnel Monitoring Devices Worn: \_\_\_\_\_
2. Personnel Protective Clothing Worn: \_\_\_\_\_
3. Hood Exhaust on High: \_\_\_\_\_
4. Air Sampling Devices Functioning: \_\_\_\_\_
5. Survey and Monitoring Instruments Functioning: \_\_\_\_\_
6. Dosimeters Logged in and Reset: \_\_\_\_\_
7. Closed Circuit Television Manned and Operational \_\_\_\_\_
8. Intercom Functioning: \_\_\_\_\_

**C. Special Conditions, Incidents or Remarks:**  
\_\_\_\_\_  
\_\_\_\_\_

BY-PRODUCT MATERIAL INVENTORY LOGA. Current Material in House

1. Amount (s): \_\_\_\_\_
2. Isotope (s): \_\_\_\_\_
3. Date: \_\_\_\_\_
4. Client Corporation(s): \_\_\_\_\_
5. J.G.S. Job Number: \_\_\_\_\_
6. Status: check one \_\_\_\_\_ incoming \_\_\_\_\_ in process \_\_\_\_\_ outgoing
7. Status: check one \_\_\_\_\_ incoming \_\_\_\_\_ in process \_\_\_\_\_ outgoing

B. Incoming By-product Material

1. Date: \_\_\_\_\_ J.G.S. Job Number \_\_\_\_\_
2. Time of Arrival: \_\_\_\_\_
3. Name of Final Carrier and Telephone No. \_\_\_\_\_
4. Incoming Radiation Survey: below 200 mr/hr contact level \_\_\_\_\_  
below 10mr/hr at 3 feet level \_\_\_\_\_  
below .01 uCi/100 cm<sup>2</sup> \_\_\_\_\_  
Time of survey \_\_\_\_\_

Remarks: \_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
Radiation Safety Officer

C. Outgoing By-product Material

1. Date: \_\_\_\_\_ Time: \_\_\_\_\_ J.G.S. Job Number \_\_\_\_\_
2. Destination: \_\_\_\_\_
3. Pick-up Carrier: \_\_\_\_\_
4. Exit and Packing Inspection: below 200 mr/hr contact level \_\_\_\_\_  
below 10 mr/hr at 3 feet level \_\_\_\_\_  
packing inspection correct \_\_\_\_\_  
DOT Label \_\_\_\_\_  
Exit Survey \_\_\_\_\_

D. Radioactive Waste

1. Amount: \_\_\_\_\_
2. Date of Pick-up: \_\_\_\_\_
3. Isotope(s): \_\_\_\_\_
4. J.C.S. Job No.: \_\_\_\_\_
5. Weight: \_\_\_\_\_
6. Client Corporation: \_\_\_\_\_
7. D.O.Y. Class 7 Level III Labels Affixed: \_\_\_\_\_
8. "Radioactive" Stenciled on properly: \_\_\_\_\_
9. Barrel Monitored and Radiation Level at contact below 2 mr/hr: \_\_\_\_\_
10. No removable contamination on surface: \_\_\_\_\_
11. Liner and locking collar secured: \_\_\_\_\_
12. Name of NRC Licensed Disposal Service  
(If different than Interex Corporation) \_\_\_\_\_
13. License on File: \_\_\_\_\_



Revision II

Date 12-17-79

Page 8 of 8

AIR QUALITY SAMPLING LOG

Date \_\_\_\_\_ Time \_\_\_\_\_ Background cpm \_\_\_\_\_

Note: Net cpm = gross cpm - bkg cpm

Particulate Filter #1 (daily) Gross cpm \_\_\_\_\_ Net cpm \_\_\_\_\_

Particulate Filter #2 (daily) Gross cpm \_\_\_\_\_ Net cpm \_\_\_\_\_

Roof Final Hood Exhaust  
Particulate Filter (weekly) Gross cpm \_\_\_\_\_ Net cpm \_\_\_\_\_

Interior Charcoal Exhaust  
Filter (weekly) Gross cpm \_\_\_\_\_ Net cpm \_\_\_\_\_

Interior High Efficiency  
Exhaust Filter (weekly) Gross cpm \_\_\_\_\_ Net cpm \_\_\_\_\_

Interior Hood Exhaust Total Filters last changed on date: \_\_\_\_\_

\_\_\_\_\_  
Radiation Safety Officer

Section III-2

Exposure of Individuals in Restricted Areas

1. Maximum Permissible Dose per Calendar Quarter

<u>Condition of Exposure</u>	<u>rams/Quarter</u>
Whole Body	1,250
Head and Trunk	1,250
Active blood forming organs	1,250
Lens of eye	1,250
Gonads	1,250
Hands and Forearms: feet; ankles	18,750
Skin of whole body	7,500

Note: Any dose in excess of the above limits shall be considered unacceptable and indicative of poor health physics hygiene and neglect in using proper shielding.

2. Special Operating Conditions

a. An individual may be allowed to receive a dose to the whole body greater than the above table provided:

- (1) During any calendar quarter the whole body dose shall not exceed 3000 rams.
- (2) The whole body dose, when added to the accumulated occupational dose to the whole body shall not exceed,  $5(N-18)$  Rams where  $N$  = individuals age at last birthday.
- (3) The accumulated occupational whole body dose shall be calculated on Form NRC-4.\*
- (4) Permission to operate up to this level is received from both the Radiation Safety Officer, President of the corporation, and Corporate Physician.

\*Note: Determination of accumulated dose shall be in accordance with CFR Title 10, Chapter 1, Part 20, Paragraph 20.102.

Section III-3Description of permanently established Hot Lab and Access Area

1. J. G. Sylvester Associates, is located at 900 Hingham St., in Rockland, Massachusetts. The firm leases approximately three acres of land upon which a one story combination concrete and concrete block building stands. This building is centrally located and has approximately 7500 square feet of floor space of which approximately 200 square feet is built and shielded for the use of radioactive by-product open source material.

The radioactive by-product open source material area described on Sketch 1 as the "Hot Lab" shall be considered a high radiation area, it's adjacent "Access Room" shall be considered a Radiation area.

The hot lab has a concrete floor poured directly on the earth beneath, and all the walls are 12" thick solid concrete block which stand 12 foot high. The roof is of conventional wood and tar construction. No access is possible to the roof except by use of an outside ladder. The door to the hot lab is constructed of 1 1/2" standard solid steel.

The door is equipped with a coded simplex locking mechanism on the outside to prevent unauthorized entrance. The hot lab is equipped with a ventilation exhaust system described as follows: A two speed high volume exhaust blower is mounted on the roof, from this blower a 12" duct runs perpendicularly into the hot lab. At 90° from this 12" master duct, twenty-one feet of 12 inch duct are laid across the hot lab interior ceiling in an "L" shape. From this horizontal ducting six 6" 90° feeder ducts are located at equal distances to provide uniform suction throughout the hooded enclosures. Before the horizontal ducting meets the master duct a 24" x 24" filter-box assembly is located; which contains charcoal, high efficiency and perspex particulate filters to assure complete removal of any possible contaminants.

The hot lab is equipped with a victoreen Model 808D monitor alarm. The alarm housing is mounted on the exterior access wall, while the probe assembly is mounted on the interior of the hot lab. The present alarm level is fixed on 25 mr/hr. The victoreen Vamp 808D allows visual metered determination (up to 1R) from the outside of the laboratory.

Should the radiation level within the hot lab rise over 25 mr/hr, both an audible and visual alarm are tripped and remain so until the reset switch is activated. In addition, above the Model 808D is a Fisher "Lab-Larm" hood exhaust monitor alarm consisting of both audible and visual alarm signals which are actuated if the hood exhaust velocity drops more than 10% of it's present value. Specifically the exhaust hoods in the Hot Lab pull 300 linear feet per minute (LFM); if the value dropped to 270 LFM the alarm system would be triggered and the working personnel in this area would be made immediately aware of the potential hazard and be able to suspend their operations until the problem was corrected.

Both laboratory benches are designed (see sketch #1) with sliding plexiglass panels 48" x 48" so that both ease of access to equipment and maximum shielding and containment is afforded. The benches are all sealed and painted with acrylic coatings to aid in decontamination procedures.

For shielding purposes twenty-five, 8" x 4" x 2" lead bricks are available as well as 200, 8" x 4" x 2" solid high density concrete bricks which can be arranged in any configuration necessary to provide maximum shielding capability. Furthermore, two 12" high, 9" diameter, 1/2" thick lead pigs are also available for storage purposes.

Four sets of 24" grip tongs are provided for close-in handling of small objects, while for materials of greater size a five foot master remote handling tool is present, along with six assorted interchangeable jaws capable of lifting up to eighty pounds or handling a 10 ml. beaker adroitly.

#### Section IV

##### Facility, Equipment and Environment Inspections

1. Hot lab inspections will be conducted by the Radiation Safety Officer upon completion of every analysis. The inspection will consist of an area survey and swipe survey. Any contaminated surfaces will then be decontaminated if possible. If it is not possible or practicable the contaminated surface shall be considered radioactive and permanently marked with a yellow circular tag or disposed in accordance with these procedures.

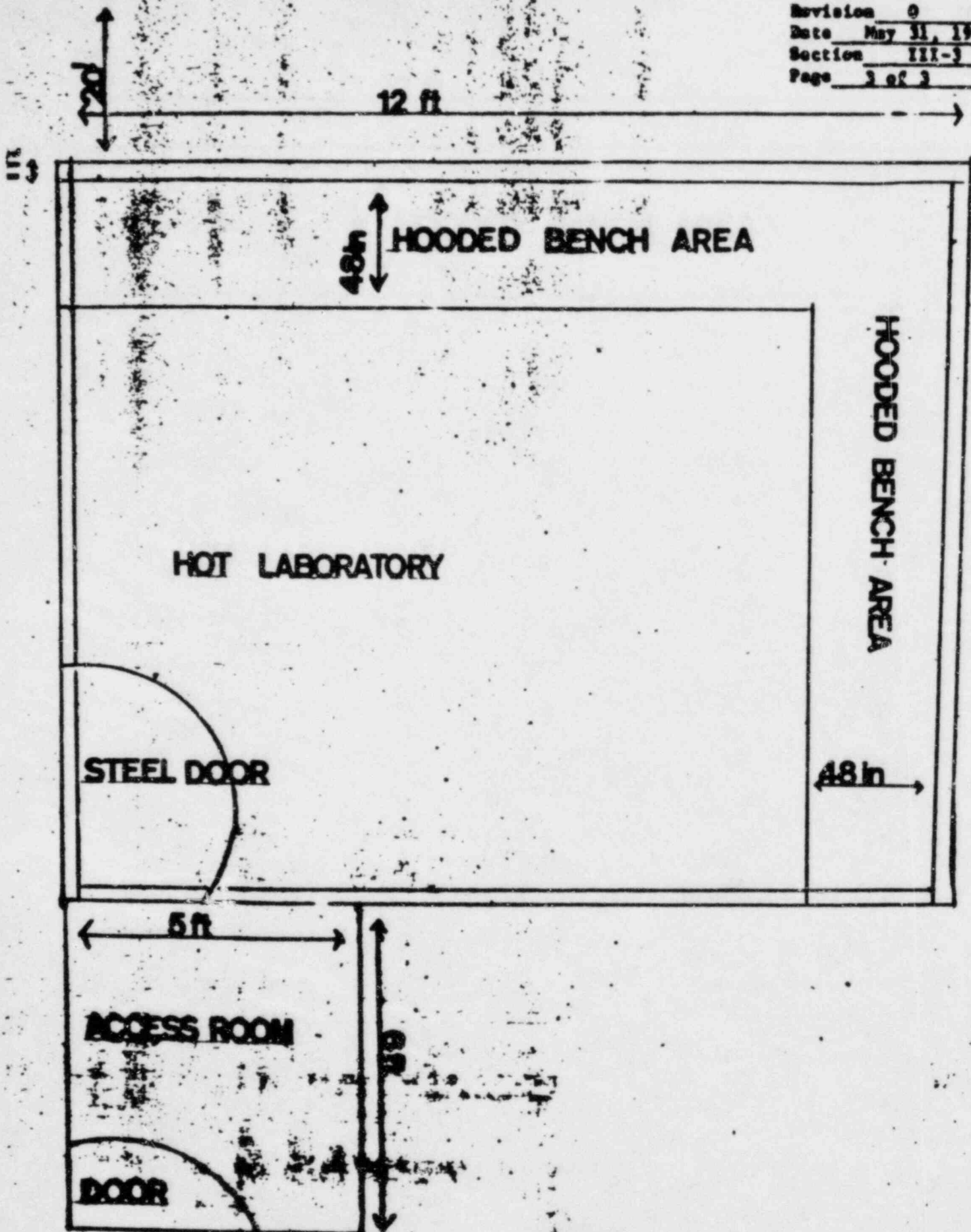
During hot lab major work operation, air sampling will be performed in the lab and at the discharge of the hood exhaust filter assembly for radioactivity. Major work operations are considered to be opening sealed containers, machining, sawing, cleaning and any decontamination procedures. This will be accomplished using a low volume air sampler which draws air through a filter paper. The filter paper shall be counted as if it was a swipe test. Maximum permissible concentrations shall be based on 10 CFR 20.103. The results of these tests will be recorded in an air quality sampling log maintained in and by the Radiation Safety Officer.

Periodically, hood exhaust filters, both particulate and charcoal will be monitored individually and when a survey indicates any level of radiation greater than 100 cpm, the filters will be replaced. The old filters will be considered radioactive waste and disposed accordingly. If within a twelve month period no radioactivity is detected, all filters will be changed and replaced with fresh ones. In such a case the old filters will be considered radioactive waste and disposed of as radioactive waste. A recorded entry of such a change will be made and maintained in the air quality sampling log.



FENCE 8 ft BARBED WIRE

Revision 0  
Date May 31, 1977  
Section III-3  
Page 1 of 2



SKETCH NO. 1



RADIATION SAFETY TRAINING PROGRAM

<u>Subject</u>	<u>Assistant Radiographer</u>	<u>Radiographer</u>	<u>Recurrent Training</u>
<b>I. <u>Introduction</u></b>			
A. "Introduction" Film Strips	1/2 hr.	0	0
B. General Principles of Penetrating Radiation	1/4 hr.	1/4 hr.	0
C. Relationship of Penetrating, Radiation, Radiography and Radiometry	1/4 hr.	0	0
D. Areas of Application	1/2 hr.	0	0
<b>II. <u>Principles and Characteristics of Xray and Gamma Radiation</u></b>			
A. "Origin of Penetrating Radiation" Film Strip	1/2 hr.	0	0
B. Nature of Penetrating Radiation (all types briefly, Xray and Gamma detailed)	1 hr.	1 hr.	1/4 hr.
1. Particles			
2. Wave properties			
3. Electromagnetic waves			
4. Electrical theory of matter			
5. Fundamentals of radiation physics			
6. Sources of radiation:			
a. Electronic			
b. Isotopes			
C. Interaction between penetrating radiation and matter.	2 hr.	1 hr.	1/2 hr.
1. "Radiation Characteristics and Interactions with Matter" Film Strip			
2. Absorption			
3. Scatter			
4. Pair production			
5. Photoelectric effect			
6. Other secondary emission			
D. Radiography	1/4 hr.	1/4 hr.	0
1. Imaging by film			
2. Imaging by fluorescent materials			
3. Imaging by electronic devices			

<u>Subject</u>	<u>Assistant Radiographer</u>	<u>Radiographer</u>	<u>Recurrent Training</u>
<b>III. <u>Radiation Sources</u></b>			
<b>A. Electronic Sources</b>	<b>2 hr.</b>	<b>1 hr.</b>	<b>1 hr.</b>
1. "Xray Equipment and Generation of Xrays" Film Strip			
2. Xray sources:			
a. Generators and tubes as an integrated system			
b. Electron sources:			
Cold cathode			
Hot cathode			
Beam focusing			
Field emission			
Other			
c. Targets:			
Material			
Configuration			
Heat dissipation			
d. Equipment design consideration			
Generating wave shape			
Window design			
Duty cycle			
R. output			
Tube shielding			
<b>B. Isotopic Sources</b>	<b>4 hr.</b>	<b>1 hr.</b>	<b>1/2 hr.</b>
1. "Gamma Ray Sources and Equipment" Film Strip			
2. Gamma			
a. Types			
b. Spectra			
c. Activity including self-absorption			
d. Handling			
3. Beta			
4. Bremsstrahlung			
5. Neutron			
6. Practical demonstration of equipment			
<b>IV. <u>Units of Radiation</u></b>			
<b>A. Radiation dose (MREO)</b>	<b>1 hr.</b>	<b>1/2 hr.</b>	<b>1/4 hr.</b>
1. Discussion of cumulative effect			
2. Discussion of units of measurement			

<u>Subject</u>	<u>Assistant Radiographer</u>	<u>Radiographer</u>	<u>Recurrent Training</u>
B. Radiation Activity (curies)	1 hr.	1/2 hr.	1/4 hr.
1. Discussion and contrast of energy and activity			
2. Units of measurement			
C. Measurement of MREM and curies	2 hr.	1 hr.	1/2 hr.
1. Show Film Strip #5, "Radiation Safety"			
2. Discussion of principles of operation of survey meters			
a. Demonstrate operation of survey meter			
b. Discuss the units of radiation (MR) measured			
c. Calibration procedures			
d. Limitations of survey meters			
3. Discussion of use of film badges	1/2 hr.	1/4 hr.	1/4 hr.
a. How to wear			
b. When to replace			
c. Units measured			
4. Discussion of dosimeters and pocket chambers	1 1/2 hr.	3/4 hr.	1/4 hr.
a. Principle of operation			
b. Where to wear			
c. How to read			
d. Units of information (MR)			
e. When to recharge			
f. Required records			
g. Note, when off scale, film badge to be developed			
5. Discussion of accidental exposure to film badge or dosimeter while not actually exposing individual	1/4 hr.	1/4 hr.	1/4 hr.
a. Required written report			
V. <u>Health Hazards of Radiation</u>	1/2 hr.	1/4 hr.	1/4 hr.
A. Discussion of normal absorbed radiation from the sun			
B. Over exposure of radiation to the individual			
1. Effects			
a. No immediate sensations			
b. Genetic ramifications			

<u>Subject</u>	<u>Assistant Radiographer</u>	<u>Radiographer</u>	<u>Recurrent Training</u>
<ul style="list-style-type: none"> <li>c. Radiation burns, internal &amp; external</li> <li>d. Unknown effects - discussion</li> <li>e. Discussion of cumulative effects</li> </ul>			
C. Protection from radiation (time, distance, shielding)	3 hr.	3 hr.	1 1/4 hr.
1. Distance			
a. Discuss inverse square law and do problems			
2. Time			
a. Discussion and work out formulas			
3. Shielding			
a. Density characteristics of material			
b. Half value layer of materials			
c. Natural barriers such as earth, buildings, water			
d. Geometric principles			
e. Radiation is emitted in all directions - discussion			
f. Collimators - discussion			
4. Discussion of combination of methods with examples and open class discussion and solving problems			
VI. <u>Radiation Surveys</u>	2 hr.	1 hr.	1/2 hr.
A. Discussion of how to perform surveys			
B. When surveys are required			
1. Entering vault			
2. Receiving source containers and projectors			
3. During each exposure			
4. After each exposure			
a. Emphasis on correct technique			
5. After locking up source			
6. Before and after transit			
7. Records required			

<u>Subject</u>	<u>Assistant Radiographer</u>	<u>Radiographer</u>	<u>Recurrent Training</u>
C. Leak test surveys	1 1/2 hr.	1 hr.	1/2 hr.
1. Use of equipment			
2. How to perform			
3. Required frequency			
4. Required records			
VII. <u>Review, Discuss and Study Federal Regulations 10 CFR Parts 19, 20 and 34</u>	6 hr.	3 hr.	2 hr.
VIII. <u>Review, Discuss and Study J. G. Sylvester Associates "Administrative Control and Radiological Protection Procedures" latest revision</u>	4 hr.	2hr.	1 hr.
A. Issue "Operating Instructions" and "Emergency Procedures" to each individual. Read out to class and discuss			
IX. <u>Give Written, Oral, Practical Demonstration Exam</u>			
Total Hours	34.5	18	9.5