FORM NRC-313M (8-78) 10 CFR 35

U.S. NUCLEAR REGULATORY COMMISSION

APPLICATION FOR MATERIALS LICENSE – MEDICAL

Approved: GAO R0557

INSTRUCTIONS – *Complete Items 1 through 26 if this is an initial application or an application for renewal of a license. Use supplemental sheets where necessary. Item 26 must be completed on all applications and signed. Retain one copy. Submit original and one copy of entire application to: Director, Office of Nuclear Materials Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Upon approval of this application, the applicant will receive a Materials License. An NRC Materials License is issued in accordance with the general requirements contained in Title 10, Code of Federal Regulations, Part 30, and the Licensee is subject to Title 10, Code of Federal Regulations, Parts 19, 20 and 35 and the license fee provision of Title 10, Code of Federal Regulations, Part 170. The license fee category should be stated in Item 26 and the appropriate fee enclosed.*

1.a. NAME AND MAILING ADDRESS OF APPLICANT *(Institution, firm, clinic, physician, etc.)* INCLUDE ZIP CODE

Bates County Memorial Hospital
Nuclear Medicine Department
615 W. Nursery St.
Butler, Missouri 64730

TELEPHONE NO.: AREA CODE(816 679-4135

1.b. STREET ADDRESS(ES) AT WHICH RADIOACTIVE MATERIAL WILL BE USED *(If different from 1.a.)* INCLUDE ZIP CODE

Same as 1.a., also
see item 1.b. on page 16

2. PERSON TO CONTACT REGARDING THIS APPLICATION

Jerry L. Harris

TELEPHONE NO.: AREA CODE(417 831-6520

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

a. ☐ NEW LICENSE
b. ☐ AMENDMENT TO LICENSE NO. _____
c. ☒ RENEWAL OF LICENSE NO. 24-18740-01

4. INDIVIDUAL USERS *(Name individuals who will use or directly supervise use of radioactive material. Complete Supplements A and B for each individual.)*

Louis Gehm M.D. Wayne E. Putnam D.O.
M. Ted Moore M.D.
Carl M. Regier M.D.

5. RADIATION SAFETY OFFICER (RSO) *(Name of person designated as radiation safety officer. If other than individual user, complete resume of training and experience as in Supplement A.)*

Louis Gehm M.D.

6.a. RADIOACTIVE MATERIAL FOR MEDICAL USE

RADIOACTIVE MATERIAL LISTED IN:	ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
10 CFR 31.11 FOR IN VITRO STUDIES		
10 CFR 35.100, SCHEDULE A, GROUP I	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP II	X	AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP III	X	5,000
10 CFR 35.100, SCHEDULE A, GROUP IV		AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP V		AS NEEDED
10 CFR 35.100, SCHEDULE A, GROUP VI		

ADDITIONAL ITEMS:	MARK ITEMS DESIRED "X"	MAXIMUM POSSESSION LIMITS (In millicuries)
IODINE-131 AS IODIDE FOR TREATMENT OF HYPERTHYROIDISM		
PHOSPHORUS-32 AS SOLUBLE PHOSPHATE FOR TREATMENT OF POLYCYTHEMIA VERA, LEUKEMIA AND BONE METASTASES		
PHOSPHORUS-32 AS COLLOIDAL CHROMIC PHOSPHATE FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
GOLD-198 AS COLLOID FOR INTRACAVITARY TREATMENT OF MALIGNANT EFFUSIONS.		
IODINE-131 AS IODIDE FOR TREATMENT OF THYROID CARCINOMA		
XENON-133 AS GAS OR GAS IN SALINE FOR BLOOD FLOW STUDIES AND PULMONARY FUNCTION STUDIES.	X	300

6.b. RADIOACTIVE MATERIAL FOR USES NOT LISTED IN ITEM 6.a. *(Sealed sources up to 3 mCi used for calibration and reference standards are authorized under Section 35.14(d), 10 CFR Part 35, and NEED NOT BE LISTED.)*

ELEMENT AND MASS NUMBER	CHEMICAL AND/OR PHYSICAL FORM	MAXIMUM NUMBER OF MILLICURIES OF EACH FORM	DESCRIBE PURPOSE OF USE

RECEIVED BY LFMB
Date 3/7/85
Log 11 March 4
By CP
Orig. To 3
Action Compl

Ex 10.11(a)(a)
FEE EXEMPT

CONTROL NO. 7837

'85 MAR -7 AM 11:19
U.S.N.R.C. FEE MGMT. BRANCH

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REGION III

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FEB 25 1985

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REG3 LIC30
24-18740-01 PDR

FORM NRC-313M (8-78)

INFORMATION REQUIRED FOR ITEMS 7 THROUGH 23

For Items 7 through 23, check the appropriate box(es) and submit a detailed description of all the requested information. Begin each item on a separate sheet. Identify the item number and the date of the application in the lower right corner of each page. If you indicate that an appendix to the medical licensing guide will be followed, do not submit the pages, but specify the revision number and date of the referenced guide: Regulatory Guide 10.8 , Rev. #1 Date: Oct. 1980

7. MEDICAL ISOTOPES COMMITTEE	
X	Names and Specialties Attached; and
X	Duties as in Appendix B; or *(Check One)*
	Equivalent Duties Attached
8. TRAINING AND EXPERIENCE	
	Supplements A & B Attached for Each Individual User; and
	Supplement A Attached for RSO.
9. INSTRUMENTATION *(Check One)*	
X	Appendix C Form Attached; or
	List by Name and Model Number
10. CALIBRATION OF INSTRUMENTS	
X	Appendix D Procedures Followed for Survey Instruments; or *(Check One)*
	Equivalent Procedures Attached; and
X	Appendix D Procedures Followed for Dose Calibrator; or *(Check One)*
	Equivalent Procedures Attached
11. FACILITIES AND EQUIPMENT	
X	Description and Diagram Attached
12. PERSONNEL TRAINING PROGRAM	
X	Description of Training Attached
13. PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL	
X	Detailed Information Attached
14. PROCEDURES FOR SAFELY OPENING PACKAGES CONTAINING RADIOACTIVE MATERIALS *(Check One)*	
X	Appendix F Procedures Followed; or
	Equivalent Procedures Attached

15. GENERAL RULES FOR THE SAFE USE OF RADIOACTIVE MATERIAL *(Check One)*	
X	Appendix G Rules Followed; or
	Equivalent Rules Attached
16. EMERGENCY PROCEDURES *(Check One)*	
X	Appendix H Procedures Followed; or
	Equivalent Procedures Attached
17. AREA SURVEY PROCEDURES *(Check One)*	
X	Appendix I Procedures Followed; or
	Equivalent Procedures Attached
18. WASTE DISPOSAL *(Check One)*	
X	Appendix J Form Attached; or
	Equivalent Information Attached
19. THERAPEUTIC USE OF RADIOPHARMACEUTICALS *(Check One)*	
	Appendix K Procedures Followed; or
	Equivalent Procedures Attached
20. THERAPEUTIC USE OF SEALED SOURCES	
	Detailed Information Attached; and
	Appendix L Procedures Followed; or *(Check One)*
	Equivalent Procedures Attached
21. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES (e.g., Xenon – 133)	
X	Detailed Information Attached
22. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL IN ANIMALS	
	Detailed Information Attached
23. PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE MATERIAL SPECIFIED IN ITEM 6.b	
	Detailed Information Attached

24. PERSONNEL MONITORING DEVICES

TYPE (Check appropriate box)			SUPPLIER	EXCHANGE FREQUENCY
a. WHOLE BODY	X	FILM	Siemens Gammasonics, Inc.	Monthly
		TLD		
		OTHER (Specify)		
b. FINGER		FILM		
	X	TLD	Siemens Gammasonics, Inc.	Monthly
		OTHER (Specify)		
c. WRIST		FILM		
		TLD		
		OTHER (Specify)		

d. OTHER (Specify)

25. FOR PRIVATE PRACTICE APPLICANTS ONLY

a. HOSPITAL AGREEING TO ACCEPT PATIENTS CONTAINING RADIOACTIVE MATERIAL

NAME OF HOSPITAL

MAILING ADDRESS

CITY | STATE | ZIP CODE

b. ATTACH A COPY OF THE AGREEMENT LETTER SIGNED BY THE HOSPITAL ADMINISTRATOR.

c. WHEN REQUESTING THERAPY PROCEDURES, ATTACH A COPY OF RADIATION SAFETY PRECAUTIONS TO BE TAKEN AND LIST AVAILABLE RADIATION DETECTION INSTRUMENTS.

26. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 1a certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Parts 30 and 35, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

a. LICENSE FEE REQUIRED *(See Section 170.31, 10 CFR 170)*

(1) LICENSE FEE CATEGORY: Political Subdivision

(2) LICENSE FEE ENCLOSED: $ _____

b. APPLICANT OR CERTIFYING OFFICIAL *(Signature)*

James W Baldwin

RECEIVED FEB 25 1985 REGION III

(1) NAME *(Type or Print)* Jim Baldwin

(2) TITLE Administrator

c. DATE 2-22-85

FORM NRC-313M (8-78)

CONTROL NO. 18376

Members of the Medical Isotope Committee and their specialities are:

1.	Louis Gehm M.D.	Radiology
2.	Curtis Long M.D.	Family Practice
3.	Jim Baldwin	Administrator

There are no pathologists or internal medicine specialists available to serve on the committee.

A. All users listed on page 1 have been listed as users on previous N.R.C. licenses. The following is a list of the user and his previous license no.

1. Louis Gehm M.D. 24-18740-01
2. M. Ted Moore M.D. 24-18740-01
3. Carl M. Regier M.D. 24-18740-01
4. Wayne E. Putnam D.O. 24-18732-01

B. The Radiation Safety Officer is :

Louis Gehm M.D.

Office Phone 816-679-4135
Home Phone 816-679-3409

1. Survey meters

a. Manufacturer's name: Victoreen

Manufacturer's model number: 1B CDV-715

Number of instruments available: one

Minimum range: 0 R/hr to 0.5 R/hr

Maximum range: 0 R/hr to 500 R/hr

b. Manufacturer's name: Victoreen

Manufacturer's model number: 6A CDV-700

Number of instruments available: one

Minimum range: 0 mR/hr to 0.5 mR/hr

Maximum range: 0 mR/hr to 50 mR/hr

2. Dose calibrator

Manufacturer's name: Capintec

Manufacturer's model number: CRC-6A

Number of instruments available: One

3. Instruments used for diagnostic procedures

Type of Instrument	Manufacturer's Name	Model No.
General Electric	PortaCamera	IIC

4. Other (e.g., liquid scintillation counter, area monitor, velometer)

Check appropriate items.

X 1. Survey instruments will be calibrated at least annually and following repair.

X 2. Calibration will be performed at two points on each scale used for radiation protection purposes, i.e., at least up to 1 R/hr.

The two points will be approximately 1/3 and 2/3 of full scale. A survey instrument may be considered properly calibrated when the instrument readings are within ±10 percent of the calculated or known values for each point checked. Readings within ±20 percent are considered acceptable if a calibration chart, graph, or response factor is prepared, attached to the instrument, and used to interpret readings to within ±10 percent. Also, when higher scales are not checked or calibrated, an appropriate precautionary note will be posted on the instrument.

3. Survey instruments will be calibrated

_____ a. By the manufacturer

_____ b. At the licensee's facility

(1) Calibration source

Manufacturer's name _____
Model no. _____
Activity in millicuries _____
or
Exposure rate at a specified distance _____
Accuracy _____
Traceability to primary standard _____

_____ (2) The calibration procedures in Section I of Appendix D will be used
or
_____ (3) The step-by-step procedures, including radiation safety procedures, are attached.

X c. By a consultant or outside firm

(1) Name Radiation Consultants of Mid-America

(2) Location Shawnee Mission, Kansas

(3) Procedures and sources

X have been approved by NRC and are on file in License No. 24-18831-01

_____ have been approved by an Agreement State; a copy of the Agreement State license, the procedures, and a description of the sources are attached, and the consultant's report will contain the information on

_____ the attached "Certificate of Instrument Calibration."
_____ the consultant's reporting form as attached.

_____ are described in the attachment, and the consultant's report will contain the information on

_____ the attached "Certificate of Instrument Calibration."
_____ the consultant's reporting form as attached.

CONTROL NO. 7837

A. Sources Used for Linearity Test

(Check as appropriate)

X First elution from new Mo-99/Tc-99m generator

or

_____ Other* (specify) _____

B. Sources Used for Instrument Accuracy and Constancy Tests

Radionuclide	Suggested Activity (mCi)	Activity (mCi)	Accuracy
Co-57	3-5	5	± 3%
Ba-133	0.1-0.5	0.250	± 3%
Cs-137	0.1-0.2	0.1	± 3%
Ra-226	1-2		

C. X The procedures described in Section 2 of Appendix D will be used for calibration of the dose calibrator

or

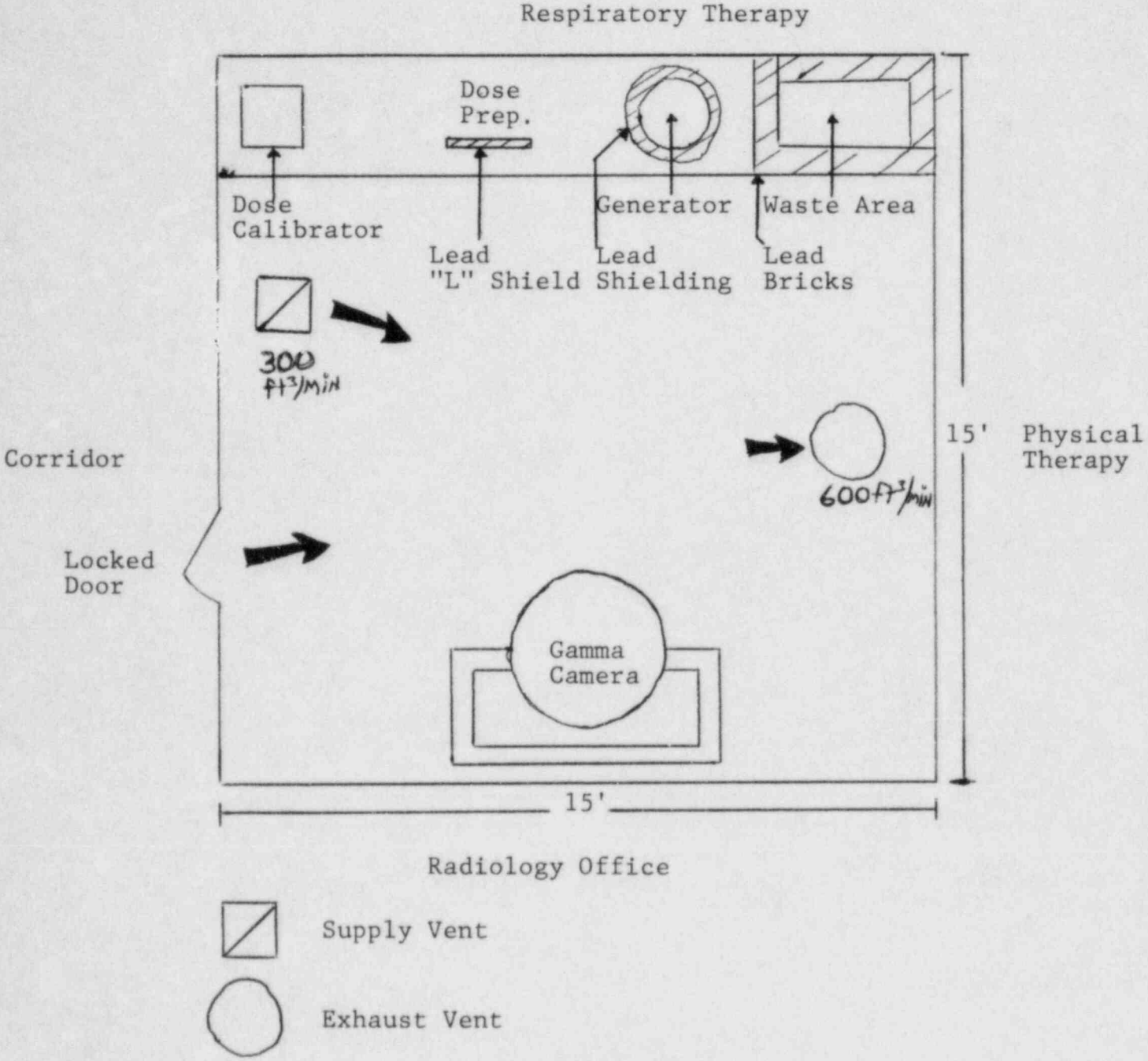
_____ Equivalent procedures are attached.

*For licensees who are not authorized for Mo-99/Tc-99m generators, activity must be equivalent to the highest activity used.

The nuclear medicine department will be located on the first floor of a brick building. The following items will be in the department for the stated purpose:

"L" shield	dose prep shielding
warning tape and signs	posting of area
plastic bags, small	shoe covers, wet containers
disposable gloves	hand protection
masking tape	fastening shoe covers
forceps, tongs	safe handling
plastic bags, large	contaminated material
sponges, 4x4	sopping up
sponges, 2x2	wipe tests
paper towels	blotting and drying
radiac wash or detergent	decontaminating
scouring powder	friction cleaning
tags	identification
scissors	cutting paper
chux	absorbing
survey meter	monitoring
lead shielded hot plate	preparation of SCS
syringe shields	hand shielding
lead syringe carrier	transporting syringes
lead bricks	shielding
hot waste container	decaying
cold waste container	regular trash
non-porous counter tops	in case of spill
non-porous floors	in case of spill
refrigerator	storage
lead pigs	safe vial handling
labels	designate radiation

"no eating, drinking, or smoking permitted" sign posted



BATES COUNTY MEMORIAL HOSPITAL

Before assuming duties, hospital personnel that will work with or near the vicinity of radioactive materials will receive proper instructions through lectures and demonstrations on the following items specified in 19.12 of 10CFR.

A. Areas where radioactive material is used and stored
B. Potential hazards associated with radioactive material
C. Radiological safety procedures appropriate to their respective duties
D. Pertinent Nuclear Regulatory Commission regulations
E. Rules and regulations of the NRC license
F. Pertinent rerms of the NRC license
G. Their obligation to report unsafe conditions
H. Appropriate response to emergencies or unsafe conditions
I. Their right to be informed of their radiation exposure and bioassay results
J. Locations where the licensee has posted or made available notices, copies of pertinent licenses and license conditions (including applications and applicable correspondence), as required by 10CFR part 19

The training program will be of sufficient scope to ensure that all personnel, including technical, clerical, nursing, housekeeping, and security understand these items. Annual refresher training will be provided or whenever significant changes in duties, regulation, or terms of the license have been made.

1. The chief nuclear medicine technologist will place all orders for radioactive material and must ensure that the requested materials and quantities are authorized by the license and that posession limits are not exceeded.

2. During normal working hours, carriers will be instructed to deliver radioactive packages directly to the nuclear medicine department.

3. During off-duty hours, security personnel will accept delivery of radioactive packages in accordance with the procedure outlined in the memorandum below.

MEMORANDUM

MEMORANDUM FOR: Security Personnel

FROM: Louis Gehm M.D. Radiation Safety Officer

SUBJECT: Receipt of Radioactive Packages

Any package containing radioactive material that arrives between 4:30pm and 7:00am or on Saturday or Sunday shall be signed for by the secutity guard on duty and taken immediately to the nuclear medicine department. Unlock the door, place the package on top of the counter immediately to the left of the door, and relock the door.

If the package is wet or appears to be damaged, IMMEDIATELY contact the hospital Radiation Safety Officer or chief technologist. Ask the carrier to remain at the hospital until it can be determined that neither he nor the delivery vehicle is contaminated.

RADIATION SAFETY OFFICER: Louis Gehm M.D.

HOME PHONE: 816-679-3409 OFFICE PHONE: 816-679-4135

CHIEF TECHNOLOGIST: Kenneth Irwin CNMT

HOME PHONE: 816-679-5155 OFFICE PHONE: 816-679-4135

Note: In view of the recent problems with shallow-land burial sites used by commercial waste disposal firms, NRC is encouraging its licensees to reduce the volume of wastes sent to these facilities. Important steps in volume reduction are to segregate radioactive from nonradioactive waste, to hold short-lived radioactive waste for decay in storage, and to release certain materials in the sanitary sewer in accordance with §20.303 of 10 CFR Part 20.

1. Liquid waste will be disposed of (check as appropriate)

_X_ In the sanitary sewer system in accordance with §20.303 of 10 CFR Part 20.

_____ By commercial waste disposal service (see also Item 4 below).

_____ Other (specify): _____

2. Mo-99/Tc-99m generators will be (check as appropriate)

_X_ Returned to the manufacturer for disposal.

_____ Held for decay* until radiation levels, as measured in a low background area with a low-level survey meter and with all shielding removed, have reached background levels. All radiation labels will be removed or obliterated, and the generators will be disposed of as normal trash.**

_____ Disposed of by commercial waste disposal service (see also Item 4 below).

_____ Other (specify): _____

3. Other solid waste will be (check as appropriate)

_X_ Held for decay* until radiation levels, as measured in a low background area with a low-level survey meter and with all shielding removed, have reached background levels. All radiation labels will be removed or obliterated, and the waste will be disposed of in normal trash.

_____ Disposed of by commercial waste disposal service (see also Item 4 below).

_____ Other (specify): _____

4. The commercial waste disposal service used will be

_____
(Name) (City, State)

NRC/Agreement State License No. _____

*Be sure that waste storage areas were described in Item 11 and that they are surveyed periodically (Item 17).

**These generators may contain long-lived radioisotopic contaminants. Therefore, the generator columns will be segregated so that they may be monitored separately to ensure decay to background levels prior to disposal.

This request is for the use of Xenon-133 at Bates County Memorial Hospital. The gas will be supplied by Mallinckrodt, Inc. for clinical lung ventilation studies.

We anticipate a maximum of five (5) studies per week. The average activity per patient will be 10 millicuries. We have requested a posession limit of 300 millicuries.

We agree to follow the instructions provided in the package insert supplied with each shipment. The instructions for radioassay and radiation protection of personnel are all outlined in this package insert.

The Xe-133 will be stored under refrigeration in its original leaded shipping container. Refrigeration essentially eliminates loss of Xe-133 from its container. Unused Xe-133 will be allowed to decay in storage, under refrigeration, for a minimum of ten half lives prior to disposal. Xe-133 vials will be surveyed prior to disposal and the results recorded.

By the use of Atomic Products Corporations Pulmonex Xenon System the release of Xe-133 into the air will be prevented. The operation of the trap will be checked semi-annually by filling a balloon from the exit port on the trap. If the counts from the balloon are considerably above background. The charcoal cartridge will be considered saturated and replaced. The old cartridge will be placed in the decay waste area for ten half lives before disposa. A aurvey will be performed before disposal to ensure background readings (circular enclosed).

Nose clamps and face masks will be used to reduce Xe-133 loss. However, we anticipate a 20% loss due to leakage and diffusion.

The diagram on page 10 shows air intake and exhaust locations. No air is recirculated. The exhaust is not located within thirty (30) feet of any air intake. The air flow rates will be measured semi-annually.

In the event that there is an accidental release of Xe-133, The imaging room will be evacuated for thirty (30) minutes and the door locked to prevent inadvertent entry. Prior to reentry a survey will be performed to assure that the Xe-133 has been exhausted.

The following calculations show that the nuclear medicine imaging area meets Nuclear Regulatory Commission ventilation requirements:

Restricted Area

$$A = \frac{10 \text{ mci}}{\text{pt}} \times \frac{5 \text{ pt}}{\text{wk}} \times \frac{10^3 \text{ uci}}{\text{mci}}$$

$$A = 5 \times 10^4 \text{ uci/wk}$$

$$V = \frac{A \times F}{1 \times 10^{-5} \text{ uci/ml}}$$

$$V = \frac{5 \times 10^4 \text{ uci/wk} \times 0.20}{1 \times 10^{-5} \text{ uci/ml}}$$

$$V = 1 \times 10^9 \text{ ml/wk}$$

Required Ventilation Rate is:

$$\frac{1 \times 10^9 \text{ ml/wk}}{40 \text{ hr/wk}} \div \frac{1.7 \times 10^6 \text{ ml/hr}}{\text{ft}^3\text{/min}} = 14.7 \text{ ft}^3\text{/min}$$

Unrestricted Area

$$A = \frac{5 \text{ pt}}{\text{wk}} \times \frac{10 \text{ mci}}{\text{pt}} \times \frac{10^3 \text{ uci}}{\text{mci}} \times \frac{52 \text{ wk}}{\text{yr}}$$

$$V = \frac{600 \text{ ft}^3}{\text{min}} \times 1.49 \times \frac{10^{10} \text{ ml/yr}}{\text{ft}^3\text{/min}}$$

$$A = 2.6 \times 10^6 \text{ uci/yr} \times 0.20$$

$$V = 8.94 \times 10^{12} \text{ ml/yr}$$

$$A = 5.2 \times 10^5 \text{ uci/yr}$$

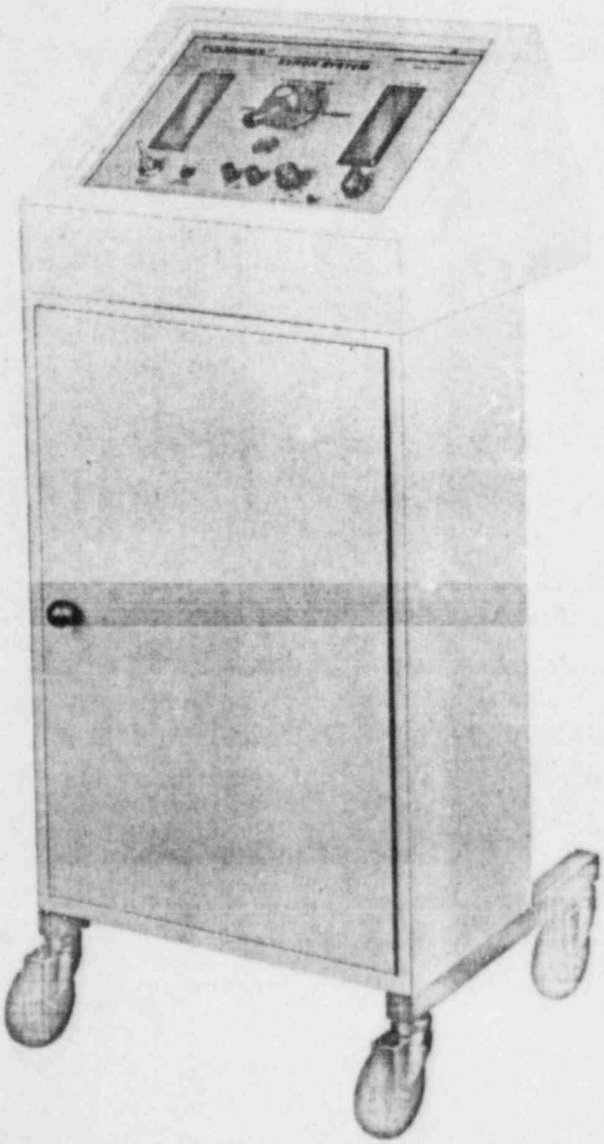
$$C = \frac{5.2 \times 10^5 \text{ uci/yr}}{8.94 \times 10^{12} \text{ ml/yr}}$$

$$C = 0.58 \times 10^{-7} \text{ uci/ml}$$

$$0.58 \times 10^{-7} \text{ uci/ml} < 3 \times 10^{-7} \text{ uci/ml}$$

PULMONEX XENON SYSTEM

One technician can perform an entire study by simply moving a single handle.



SIMPLE, SAFE OPERATION

Full-function xenon delivery system with built-in xenon gas trap for rebreathing, washout, perfusion and single breath studies on supine or seated patients.

- **Complete easy-to-use system.**
- **"Air-in"/"Air-out" breathing tubes and motor-driven circulator assures resistance-free breathing.**
- **Two lead glass windows permit observation of patient breathing bags.**
- **All flow circuits automatically controlled by a master valve system.**
- **Automatically timed washout.**
- **Accepts any commercial form of xenon.**
- **Rolls easily on large casters for positioning of supine or seated patients.**
- **Fully shielded.**
- **Carbon dioxide and moisture traps included.**

It is our intention to provide Mobile Nuclear Medicine Imaging services to the following hospitals:

Nevada City Hospital
800 South Ash
Nevada, Missouri 64772

Sac-Osage Hospital
Box 426
Osceola, Missouri 64776

Barton County Memorial Hospital
Second and Gulf Streets
Lamar, Missouri 64759

Cedar County Memorial Hospital
1401 S. Park Street
ElDorado Springs, Missouri 64744

A statement from each hospital administrator, granting approval, is enclosed. None of the hospitals listed above have active N.R.C. licenses.

Radiopharmaceuticals will be administered only under the supervision of one of the authorized users.

All doses will be assayed prior to transport.

The doses will be transported in individual lead syringe shields enclosed in a foam packed case. The case will be secured in the right rear corner of the vehicle, away from the driver.

It will not be a normal procedure to leave radioactive material in the vehicle unattended. However, if it becomes absolutely necessary, the technologist will be instructed to lock all vehicle doors to prevent unauthorized access to the material. The technologist will also drive the vehicle. He is an experienced Nuclear Medicine Technologist familiar with 10CFR 19.12, as well as procedures for decontamination and other emergencies as outlined in our Procedure Manual.

A diagram for each hospital is enclosed, showing the area to be used for imaging.

The diagnostic instruments transported by van will be calibrated at each location prior to use.

No radioactive material will be left at the hospitals listed. A contamination survey will be performed before leaving each location and all detectable contamination will be removed.

No radioactive material will be stored in the vehicle overnight. A contamination survey will be performed in the vehicle at the end of each day it is used.

All radioactive materials will be received at Nuclear Medicine Department, Bates County Memorial Hospital, Butler, Missouri under the terms and conditions of that license.

We request additional use of Xenon-133 at Nevada City Hospital, Nevada, Missouri. A description of procedures and diagram are on the following page.

ITEM 1.b. PROCEDURES AND PRECAUTIONS FOR USE OF XE-133 AT NEVADA CITY HOSPITAL

This request is for the use of Xenon-133 gas supplied by Mallinckrodt, Inc. for clinical lung ventilation studies, at Nevada City Hospital, Nevada, Missouri.

We anticipate doing two (2) studies per week with an average activity of 10 millicuries per study.

We agree to follow the instructions provided in the package insert supplied with each shipment. The instructions for radioassay and radiation protection of personnel are all outlined in this package insert.

The Xe-133 is delivered to Bates County Memorial Hospital and has a requested posession limit of 300 millicuries. All statements made on page 14 of this license renewal application concerning storage, decay and surveys will be followed, as stated. Only the number of vials needed to perform the studies will accompany the technologist to Nevada and empty vials will return with him to Bates County Hospital for decay. The vials will remain in their leaded shipping containers at all times. Records of disposition will be maintained. No by-product material will remain at Nevada City Hospital.

The Xe-133 will be released into an unrestricted area, on the roof, that is not located within thirty (30) feet of any air intake. This will be done through an exhaust tubing with a motorized blower to force the Xe-133 out of the tubing and into the exhaust duct(diagram attached).

A diagram is also attached showing the locations and measured air flow rate of the exhaust. There is no air recirculated. The air flow rates will be checked semi-annually.

In the event that there is an accidental release of Xe-133, the imaging room will be evacuated for thirty (30) minutes and the door locked to prevent inadvertent entry. Prior to reentry a survey will be performed to assure that the Xe-133 has been exhausted.

The following calculations show that the nuclear medicine imaging are at Nevada City Hospital meets Nuclear Regulatory Commission ventilation requirements:

NEVADA CITY HOSPITAL

Restricted Area

$$A = \frac{10\ \text{mci}}{\text{pt}} \times \frac{2\ \text{pt}}{\text{wk}} \times \frac{10^3\ \text{uci}}{\text{mci}}$$

$$A = 2 \times 10^4\ \text{uci/wk}$$

$$V = \frac{A \times F}{1 \times 10^{-5}\ \text{uci/ml}}$$

$$V = \frac{2 \times 10^4\ \text{uci/wk} \times 0.20}{1 \times 10^{-5}\ \text{uci/ml}}$$

$$V = 4 \times 10^8\ \text{ml/wk}$$

Required Ventilation Rate is:

$$\frac{4 \times 10^8\ \text{ml/wk}}{40\ \text{hr/wk}} \div \frac{1.7 \times 10^6\ \text{ml/hr}}{\text{ft}^3\text{/min}} = 5.9\ \text{ft}^3\text{/min}$$

Unrestricted Area

$$A = \frac{2\ \text{pt}}{\text{wk}} \times \frac{10\text{uci}}{\text{pt}} \times \frac{10^3\ \text{uci}}{\text{mci}} \times \frac{52\ \text{wk}}{\text{yr}}$$

$$A = 1 \times 10^6\ \text{uci/yr}$$

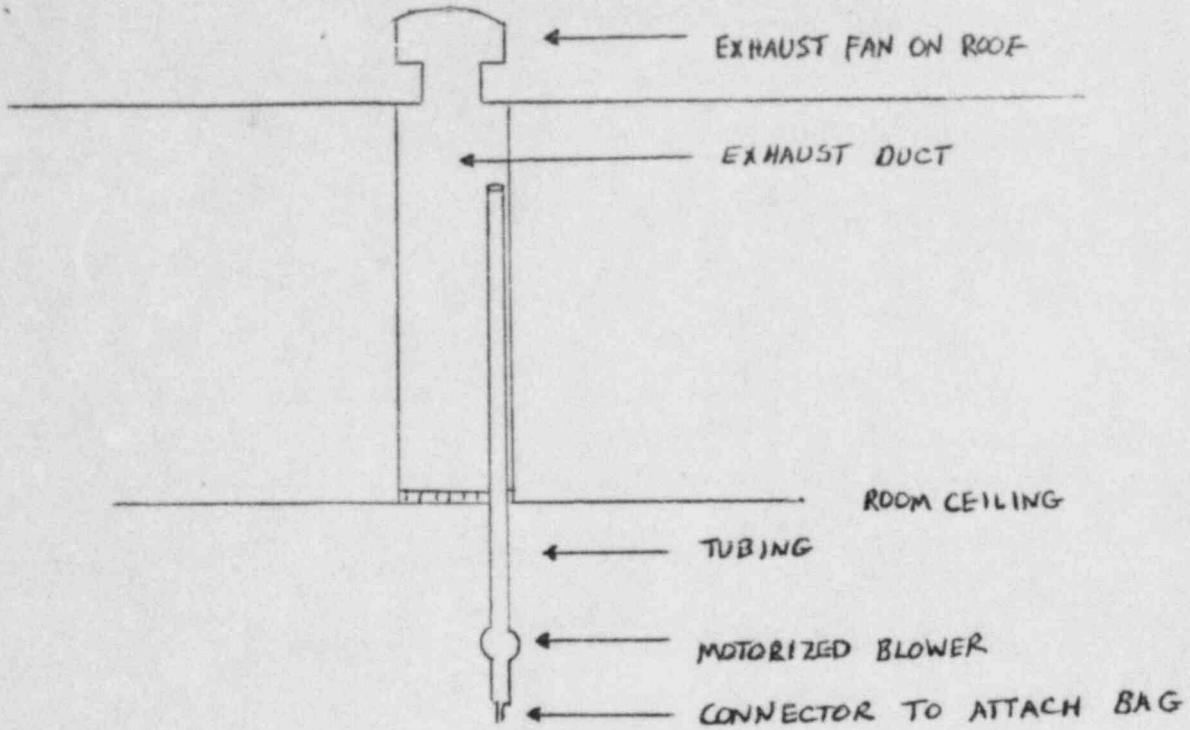
$$V = \frac{250\ \text{ft}^3}{\text{min}} \times 1.49 \times \frac{10^{10}\ \text{ml/yr}}{\text{ft}^3\text{/min}}$$

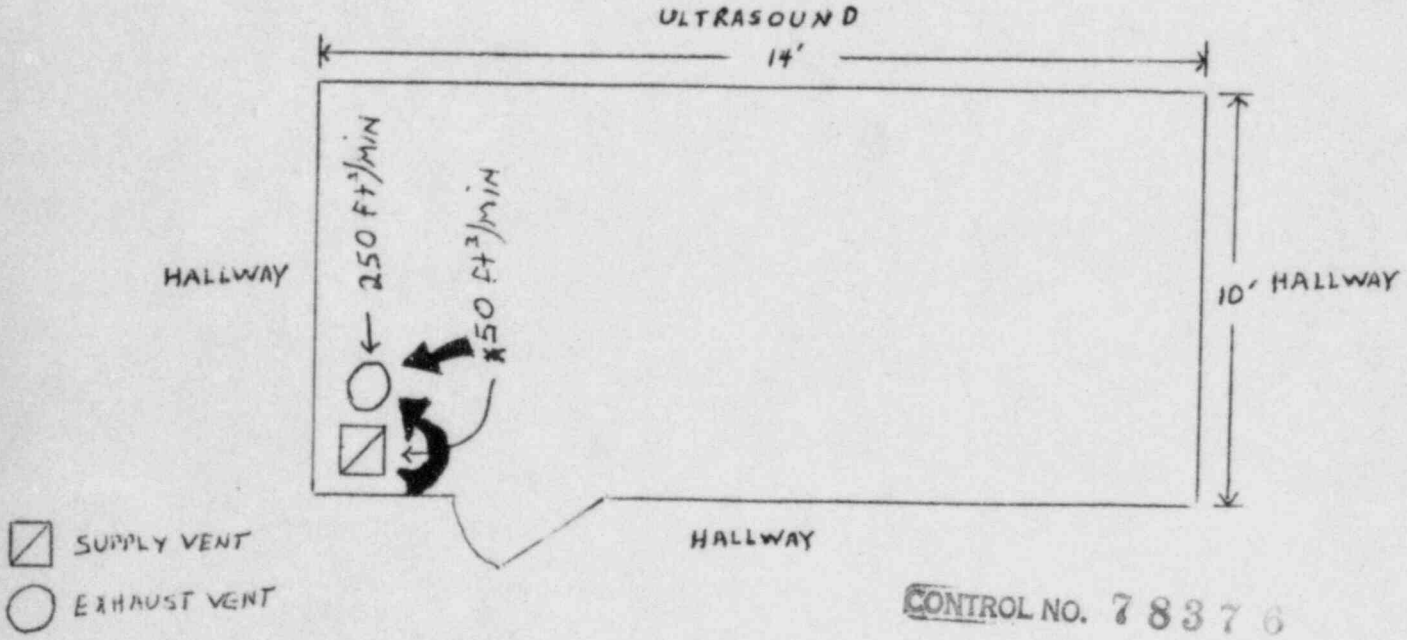
$$V = 3.73 \times 10^{12}\ \text{ml/yr}$$

$$C = \frac{10.40 \times 10^5\ \text{uci/yr}}{3.73 \times 10^{12}\ \text{ml/yr}}$$

$$C = 2.79 \times 10^{-7}\ \text{uci/ml}$$

$$2.79 \times 10^{-7}\ \text{uci/ml} < 3 \times 10^{-7}\ \text{uci/ml}$$





CONTROL NO. 78376

NEVADA CITY HOSPITAL

APPENDIX O

MODEL PROGRAM FOR MAINTAINING OCCUPATIONAL RADIATION EXPOSURES AT MEDICAL INSTITUTIONS ALARA

BATES COUNTY MEMORIAL HOSPITAL

(Licensee's Name)

2-22-85

(Date)

1. Management Commitment

a. We, the management of this (medical facility, hospital, etc.), are committed to the program described in this paper for keeping exposures (individual and collective) as low as is reasonably achievable (ALARA). In accord with this commitment, we hereby describe an administrative organization for radiation safety and will develop the necessary written policy, procedures, and instructions to foster the ALARA concept within our institution. The organization will include a Radiation Safety Committee (RSC)[1] and a Radiation Safety Officer (RSO).

b. We will perform a formal annual review of the radiation safety program, including ALARA considerations. This shall include reviews of operating procedures and past exposure records, inspections, etc., and consultations with the radiation protection staff or outside consultants.

c. Modification to operating and maintenance procedures and to equipment and facilities will be made where they will reduce exposures unless the cost, in our judgment, is considered to be unjustified. We will be able to demonstrate, if necessary, that improvements have been sought, that modifications have been considered, and that they have been implemented where reasonable. Where modifications have been recommended but not implemented, we will be prepared to describe the reasons for not implementing them.

d. In addition to maintaining doses to individuals as far below the limits as is reasonably achievable, the sum of the doses received by all exposed individuals will also be maintained at the lowest practicable level. It would not be desirable, for example, to hold the highest doses to individuals to some fraction of the applicable limit if this involved exposing additional people and significantly increasing the sum of radiation doses received by all involved individuals.

[1] Private practice physician licenses do not include an RSC.

2. Radiation Safety Committee (RSC)[2]

a. Review of Proposed Users and Uses

(1) The RSC will thoroughly review the qualifications of each applicant with respect to the types and quantities of materials and uses for which he has applied to ensure that the applicant will be able to take appropriate measures to maintain exposure ALARA.

(2) When considering a new use of byproduct material, the RSC will review the efforts of the applicant to maintain exposure ALARA. The user should have systematized procedures to ensure ALARA and shall have incorporated the use of special equipment such as syringe shields, rubber gloves, etc., in his proposed use.

(3) The RSC will ensure that the user justifies his procedures and that dose will be ALARA (individual and collective).

b. Delegation of Authority

(The judicious delegation of RSC authority is essential to the enforcement of an ALARA program.)

(1) The RSC will delegate authority to the RSO for enforcement of the ALARA concept.

(2) The RSC will support the RSO in those instances where it is necessary for the RSO to assert his/her authority. Where the RSO has been overruled, the Committee will record the basis for its action in the minutes of the Committee's quarterly meeting.

[2] The RSO on private practice physician licenses will assume the responsibilities of the RSC under Section 2

c. Review of ALARA Program

(1) The RSC will encourage all users to review current procedures and develop new procedures as appropriate to implement the ALARA concept.

(2) The RSC will perform a quarterly review of occupational radiation exposure with particular attention to instances where Investigational Levels in Table 0-1 below are exceeded. The principal purpose of this review is to assess trends in occupational exposure as an index of the ALARA program quality and to decide if action is warranted when Investigational Levels are exceeded (see Section 6).[3]

(3) The RSC will evaluate our institution's overall efforts for maintaining exposures ALARA on an annual basis. This review will include the efforts of the RSO, authorized users, and workers as well as those of management.

3. Radiation Safety Officer (RSO)

a. Annual and Quarterly Review

(1) Annual review of the radiation safety program. The RSO will perform an annual review of the radiation safety program for adherence to ALARA concepts. Reviews of specific procedures may be conducted on a more frequent basis.

(2) Quarterly review of occupational exposures. The RSO will review at least quarterly the external radiation exposures of authorized users and workers to determine that their exposures are ALARA in accordance with the provisions of Section 6 of this program.

(3) Quarterly review of records of radiation level surveys. The RSO will review radiation levels in unrestricted and restricted areas to determine that they were at ALARA levels during the previous quarter.

b. Education Responsibilities for ALARA Program

(1) The RSO will schedule briefings and educational sessions to inform workers of ALARA program efforts.

(2) The RSO will ensure that authorized users, workers, and ancillary personnel who may be exposed to radiation will be instructed in the ALARA philosophy and informed that management, the RSC, and the RSO are committed to implementing the ALARA concept.

c. Cooperative Efforts for Development of ALARA Procedures

Radiation workers will be given opportunities to participate in formulation of the procedures that they will be required to follow.

(1) The RSO will be in close contact with all users and workers in order to develop ALARA procedures for working with radioactive materials.

(2) The RSO will establish procedures for receiving and evaluating the suggestions of individual workers for improving health physics practices and will encourage the use of those procedures.

d. Reviewing Instances of Deviation from Good ALARA Practices

The RSO will investigate all known instances of deviation from good ALARA practices and, if possible, will determine the causes. When the cause is known, the RSO will require changes in the program to maintain exposures ALARA.

4. Authorized Users

a. New Procedures Involving Potential Radiation Exposures

(1) The authorized user will consult with, and receive the approval of, the RSO and/or RSC during the planning stage before using radioactive materials for a new procedure.

(2) The authorized user will evaluate all procedures before using radioactive materials to ensure that exposures will be kept ALARA. This may be enhanced through the application of trial runs.

b. Responsibility of Authorized User to Persons Under His/Her Supervision

(1) The authorized user will explain the ALARA concept and his/her commitment to maintain exposures ALARA to all persons under his/her supervision.

(2) The authorized user will ensure that persons under his/her supervision who are

[3] The NRC has emphasized that the Investigational Levels in this program are not new dose limits but, as noted in ICRP Report 26, "Recommendations of the International Commission on Radiological Protection," serve as check points above which the results are considered sufficiently important to justify further investigations.

subject to occupational radiation exposure are trained and educated in good health physics practices and in maintaining exposures ALARA.

5. **Persons Who Receive Occupational Radiation Exposure**

   a. The worker will be instructed in the ALARA concept and its relationship to working procedures and work conditions.

   b. The worker will know what recourses are available if he/she feels that ALARA is not being promoted on the job.

6. **Establishment of Investigational Levels In Order to Monitor Individual Occupational External Radiation Exposures**

   This institution (or private practice) hereby establishes Investigational Levels for occupational external radiation exposure which, when exceeded, will initiate review or investigation by the RSC and/or the RSO. The Investigational Levels that we have adopted are listed in Table O-1 below. These levels apply to the exposure of individual workers.

Table O-1

	Investigational Levels (mrems per calendar quarter)	
	Level I	*Level II*
1. Whole body; head and trunk; active blood-forming organs; lens of eyes; or gonads	125	375
2. Hands and forearms; feet and ankles	1875	5625
3. Skin of whole body*	750	2250

*Not normally applicable to nuclear medicine operations except those using significant quantities of beta-emitting isotopes.

The Radiation Safety Officer will review and record on Form NRC-5, "Current Occupational External Radiation Exposures," or an equivalent form (e.g., dosimeter processor's report), results of personnel monitoring not less than once in any calendar quarter as required by §20.401 of 10 CFR Part 20. The following actions will be taken at the Investigational Levels as stated in Table O-1:

a. Quarterly exposure of individuals to less than Investigational Level I.

   Except when deemed appropriate by the RSO, no further action will be taken in those cases where an individual's exposure is less than Table O-1 values for the Investigational Level I.

b. Personnel exposures equal to or greater than Investigational Level I, but less than Investigational Level II.

   The RSO will review the exposure of each individual whose quarterly exposures equal or exceed Investigational Level I and will report the results of the reviews at the first RSC meeting following the quarter when the exposure was recorded. If the exposure does not equal or exceed Investigational Level II, no action related specifically to the exposure is required unless deemed appropriate by the Committee. The Committee will, however, consider each such exposure in comparison with those of others performing similar tasks as an index of ALARA program quality and will record the review in the Committee minutes.

c. Exposure equal to or greater than Investigational Level II.

   The RSO will investigate in a timely manner the cause(s) of all personnel exposures equaling or exceeding Investigational Level II and, if warranted, will take action. A report of the investigation, actions taken, if any, and a copy of the individual's Form NRC-5 or its equivalent will be presented to the RSC at the first RSC meeting following completion of the investigation. The details of these reports will be recorded in the RSC minutes. Committee minutes will be sent to the management of this institution for review. The minutes, containing details of the investigation, will be made available to NRC inspectors for review at the time of the next inspection.

d. Reestablishment of an individual occupational worker's Investigational Level II to a level above that listed in Table O-1.

   In cases where a worker's or a group of workers' exposures need to exceed Investigational Level II, a new, higher Investigational Level II may be established on the basis that it is consistent with good ALARA practices for that individual or group. Justification for a new Investigational Level II will be documented.

   The RSC will review the justification for, and will approve, all revisions of Investigational Level II. In such cases, when the exposure equals or exceeds

the newly established Investigational Level II, those actions listed in paragraph 6.c above will be followed.

7. **Signature of Certifying Official**[4]

I hereby certify that this institution (or private practice) has implemented the ALARA Program set forth above.

James W Baldwin Jr
Signature

Jim Baldwin
Name (print or type)

Administrator
Title

Institution (or Private Practice) Name and Address:

Bates County Memorial Hospital
615 West Nursery Street
Butler, Missouri 64730

[4]The person who is authorized to make commitments for the administration of the institution (e.g., hospital administrator) or, in the case of a private practice, the licensed physician.

NEVADA CITY HOSPITAL

800 SOUTH ASH 417-667-3355 NEVADA, MO 64772

February 1, 1985

Radioactive material may be used at our institution under the conditions of Nuclear Regulatory Commission license no. 24-18740-01.

Albert Ban Jr.

Albert Ban, Jr.
Administrator

Sac-Osage Hospital

TERRY E. ERWINE, Administrator
Phone: (417) 646-8181
Osceola, Missouri 64776
Box 426

January 15, 1985

Mr. Jerry L. Harris
Operations Manager
Nuclear Diagnosis, Inc.
P.O. Box 3371
Springfield, MO 65808

Dear Mr. Harris:

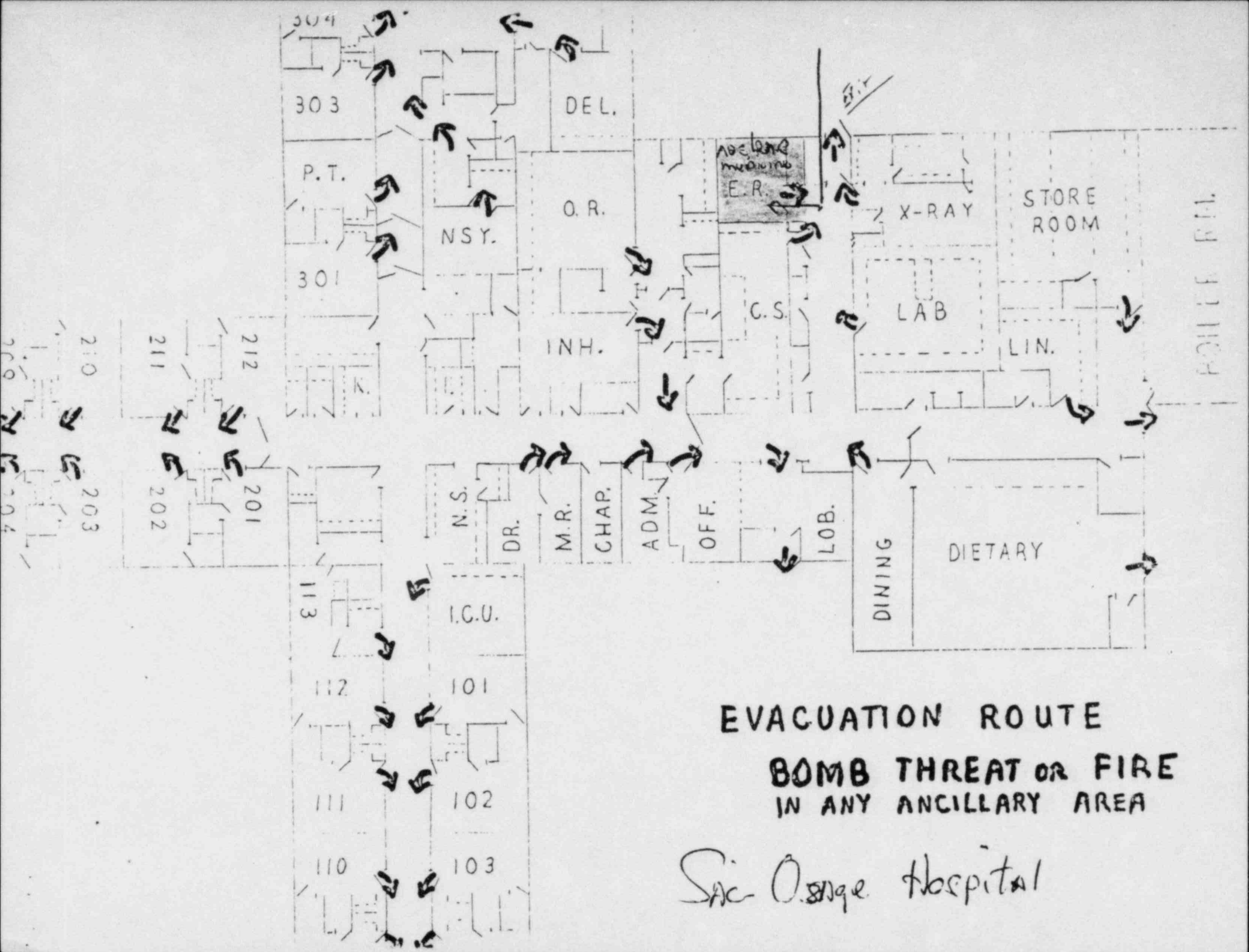
Radioactive material may be used at our institution under the conditions of Nuclear Regulatory Commissions License Number 24-18740-01.

Sincerely yours,

Terry E. Erwine
Administrator

pc

CONTROL NO. 78376


304
303
DEL.
P.T.
NSY.
O.R.
E.R.
X-RAY
STORE ROOM
301
C.S.
LAB
INH.
LIN.
211
212
210
202
201
203
N.S.
DR.
M.R.
CHAP.
ADM.
OFF.
LOB.
DINING
DIETARY
113
I.C.U.
112
101
111
102
110
103
EVACUATION ROUTE
BOMB THREAT OR FIRE
IN ANY ANCILLARY AREA
Sac Osage Hospital

BARTON COUNTY MEMORIAL HOSPITAL

SECOND AND GULF STREETS LAMAR, MISSOURI 64759 PHONE 417 682-5535

January 29, 1985

Mr. Jerry L. Harris
Operations Manager
Nuclear Diagnosis, Inc.
P.O. Box 3371
Springfield, MO 65808

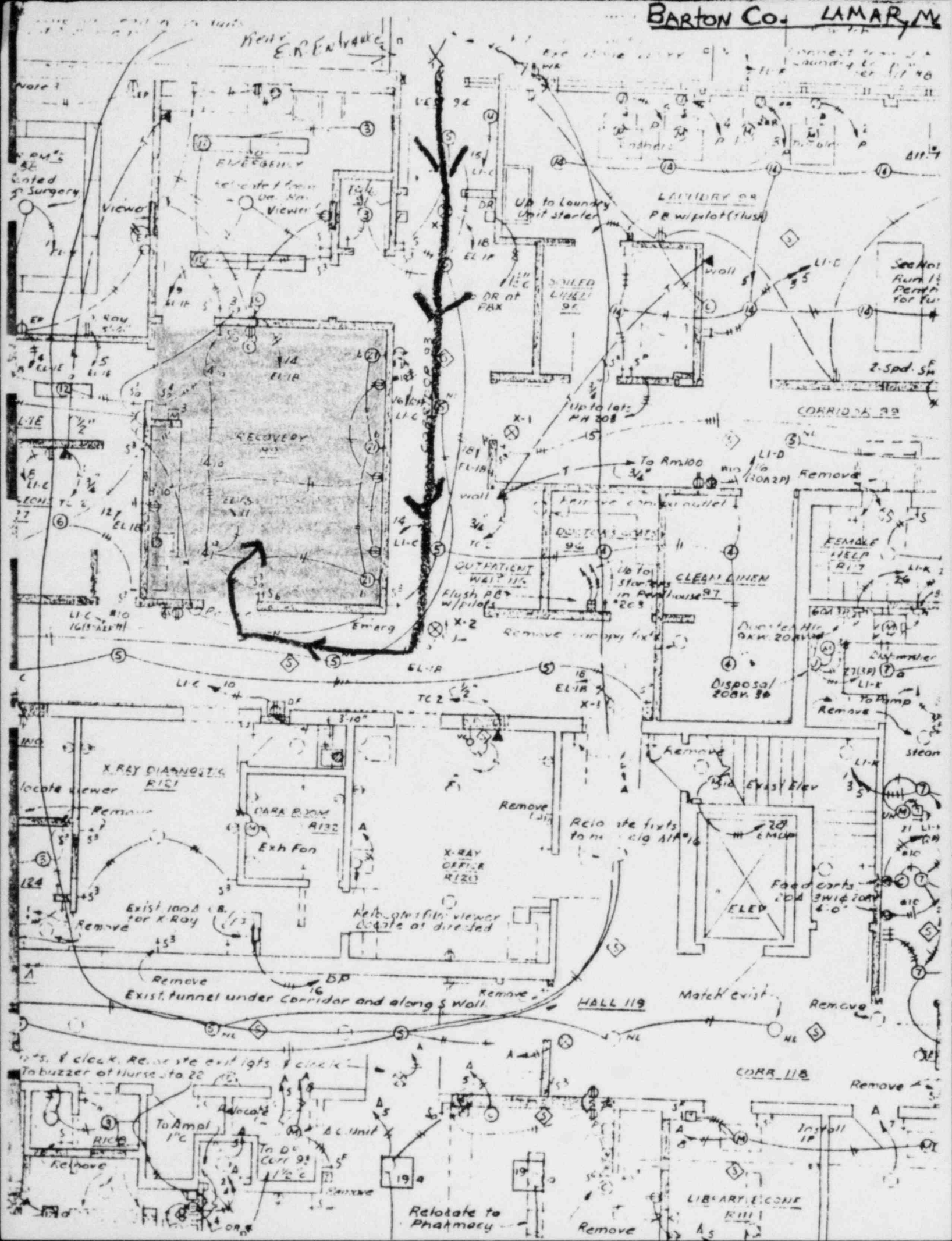
Dear Jerry:

This letter is to assure you that radioactive material may be used at our institution under the conditions of Nuclear Regulatory Commission license no. 24-18740-01.

Very truly yours,

Elden S. Selves
Administrator

ESS:vr


BARTON Co. LAMAR, Mo.
E.R. Entrance
Emergency
Viewing
Recovery
Emerg
Outpatient Wait
Clean Linen
Laundry
Corridor 99
Corridor 118
X-Ray Diagnostic R121
Dark Room R122
X-Ray Office R120
Exh Fan
Elev
Hall 119
Match exist
Remove
Relocate to Pharmacy
Library/Clinic R111
To Amal
To Buzzer at Nurse Sta 22
To Phone
Disposal
Steam

Cedar County Memorial Hospital

El Dorado Springs, Missouri 64744

Arlene Moomaw, Administrator

Telephone 417-876-2511

February 1, 1985

Nuclear Diagnosis, Inc.
P.O. Box 3371
Springfield, MO 65808

Dear Mr. Harris:

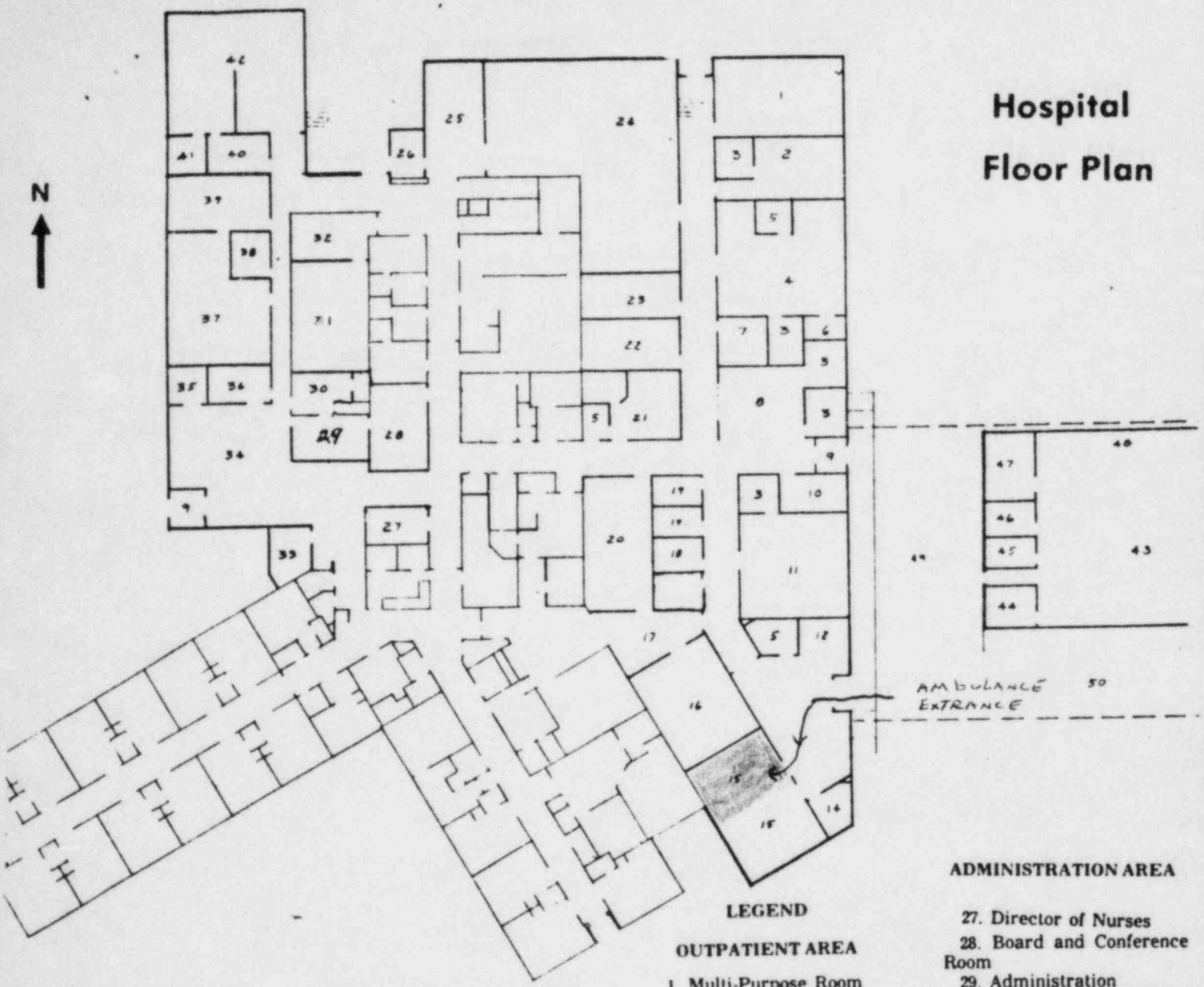
Radicactive material may be used at our institution under the conditions of Nuclear Regulatory Commission license no. 24-18740-01.

Sincerely,

Arlene Moomaw

Arlene Moomaw
Administrator

Cedar County Memorial Hospital Expansion Plan



Above is the floor plan for the addition to Cedar County morial Hospital. The plan calls for expansion on the west, th and east sides of the present building, but mostly on the t side, with approximate doubling of present space, mostly in form of out-patient facilities.

The lighter lines show the outline of the present building, and darker lines show the additional facilities.

George Pyle, hospital administrator, said that the hospital ard will probably call for bids on the construction in February. e sum of $326,000 in Hill-Burton funds is available, and this will matched by local funds.

LEGEND

OUTPATIENT AREA

1. Multi-Purpose Room
2. Inhalation Therapy
3. Office
4. Physical Therapy Area
5. Toilet
6. Storage
7. Janitor Closet and Supplies
8. Outpatient Waiting Area
9. Vestibule
10. Examination Room
11. Laboratory
12. Nurses Area and Supplies
13. Emergency Corridor
14. Clean-up
15. Emergency Room
16. Surgery
17. Surgery Corridor
18. Outpatient Surgery Change Area
19. Public Toilets
20. Recovery
21. Radiology Suite
22. Radiology Records
23. O.P. Medical Records
24. Central Storage
25. Receiving Area
26. Trash Room

ADMINISTRATION AREA

27. Director of Nurses
28. Board and Conference Room
29. Administration
30. Secretary
31. Medical Records
32. Doctor's Reading Room
33. Chapel
34. Waiting and Lobby
35. Auxiliary Sales
36. Reception and Admissions
37. Business Office
38. Bookkeeper's Office
39. Business Machine
40. Soiled Linen
41. Storage
42. Laundry

AMBULANCE GARAGE

43. 2 Bay Garage
44. Office and Records
45. Toilet
46. Ambulance Supplies
47. Maintenance Supplies
48. Building Maintenance Workshop
49. Covered Ambulance Drive
50. Doctor's Parking