

DOCTORS HOSPITAL RADIOLOGY SERVICES, INC.

2730 EAST JEFFERSON AVENUE - DETROIT, MICH. 48207 - TELEPHONE (313) 259-3050

January 19, 1983

Ms. Patricia M. Vacherlon
Licensing Assistant
Materials Licensing Section
U.S. N.R.C.
Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

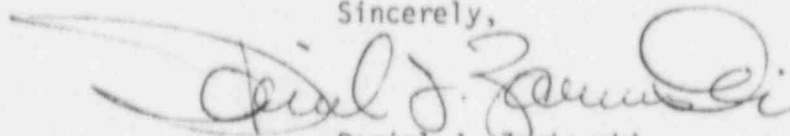
Dear Ms. Vacherlon:

In response to your letter of December 10, 1982 concerning our amendment request the following addition information is supplied:

- a. The sensitivity of the instrument is 0 - 0.5 mR/hr.
- b. The efficiency of the instrument for common medical isotopes is 1.0.
- c. The beta shield will be removed from the probe before counting the wipes.
- d. The optimum counting geometry is on the end of the probe. All counting of wipes will be at the end of the probe.
- e. The instrument response time is 90% of final reading within 10 sec. The equilibration time to be used will be 15 sec.

If there are any additional questions, please contact me or our consultant Mr. Ray A. Carlson, (313) 494-7364.

Sincerely,



Daniel J. Zaniewski,
Director of Radiology

DJZ/jmc

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In support of our request for the use of X3-133 gas the following information is submitted.

A. Quantities to be used:

1. Estimated number of patients per year is 520, with a dose of 10 mCi per patient.
2. The possession limit request is 200 mCi.

B. Use and Storage areas:

1. The Xe-133 will be both stored and used in the Department of Nuclear Medicine. The Xe-133 will be stored in the shipping container behind a lead shielded storage area.
2. The ventilation in the area where the Xe-133 will be stored and used is 300 CFM. The exhaust vents are located in the ceiling and vent directly to the roof.

C. Procedures for routine use.

1. Position patient and set up.
 - (a) Single breath - the patient inhales the Xe-133 gas and holds breath during scintigraphy.
 - (b) Rebreathing - a rebreathing study is performed through the system until equilibrium is achieved.
 - (c) Washout - the Xe-133 is exhaled from the patient and collected in the Xe-133 trap.
2. The Xe-133 gas will be supplied by New England Nuclear or Diagnostic Isotopes, and will be dispensed and collected by the Pulmonex Xenon System model no. 130-500 from Atomic Products Corp.
3. Nose clamps or face masks will be used in order to reduce possible contamination of the air.

D. Emergency Procedures in case of accidental release of Xe-133

1. All personnel and patients will leave the room and close the door.
2. Notify the Radiation Safety Offices.
3. Do not enter the room for a minimum of 10 minutes.

E. Air Concentration of Xe-133 in restricted areas.

1. Maximum amount of activity to be used per week is (A).
2. Estimate of Xe-133 lost during use and storage (f).
3. Volume of air per week for dilution of the Xe-133 (g).

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CONTROL NO. 87410

$$A = \frac{10 \text{ mCi}}{\text{patient}} \times \frac{10 \text{ patients}}{\text{week}} \times 1 \times 10^2 \frac{\text{uCi}}{\text{mCi}} = 1 \times 10^5 \frac{\text{uCi}}{\text{week}}$$

F = assume 25%

$$\begin{aligned} V &= A \times f \\ &= 1 \times 10^5 \text{ uCi/week} \times 0.25 \\ &= 1 \times 10^5 \text{ uCi/week} \\ &= 2.5 \times 10^9 \frac{\text{ml}}{\text{week}} \end{aligned}$$

The required ventilation rate is

$$\frac{2.5 \times 10^9 \text{ ml/week}}{40 \text{ hrs/week}} \times \frac{1}{1.7 \times 10^6} \frac{\text{cfm}}{\text{ml/hr}} = 36.7 \text{ cfm}$$

The actual ventilation in the area is 300 CFM which is greater than the required ventilation for a restricted area.

F. Method of Disposal

1. The Xe-133 will be collected in the model 130-500 Pulmonex Xenon system from Atomic Products Corp.

- (a) Maximum amount of Xe-133 to be released per year (A)
- (b) Air Flow per year (V)

$$A = 1 \times 10^5 \frac{\text{uCi}}{\text{week}} \times 52 \frac{\text{week}}{\text{year}} = 5.2 \times 10^6 \frac{\text{uCi}}{\text{year}}$$

Assume 75% of all Xe-133 is trapped in the system. Therefore

$$\begin{aligned} A &= 5.2 \times 10^6 \frac{\text{uCi}}{\text{year}} \times 0.25 \\ &= 1.3 \times 10^6 \frac{\text{uCi}}{\text{year}} \end{aligned}$$

$$\begin{aligned} V &= 300 \frac{\text{ft.}^3}{\text{min.}} \times 1.49 \times 10^{10} \frac{\text{ml}}{\text{ft.}^3/\text{min}} \\ &= 4.47 \times 10^{12} \text{ ml/year} \end{aligned}$$

$$\begin{aligned} C &= \frac{1.3 \times 10^6 \text{ uCi/year}}{4.47 \times 10^{12} \text{ ml/year}} \\ &= 2.9 \times 10^{-7} \text{ uCi/ml} \end{aligned}$$

2. The trap system will be surveyed monthly to ensure that the trap is working efficiently. The survey will be conducted using a Nuclear Associates Model 36-751 "Xen Alert" Xe-133 room air/trap

2. (Continued)

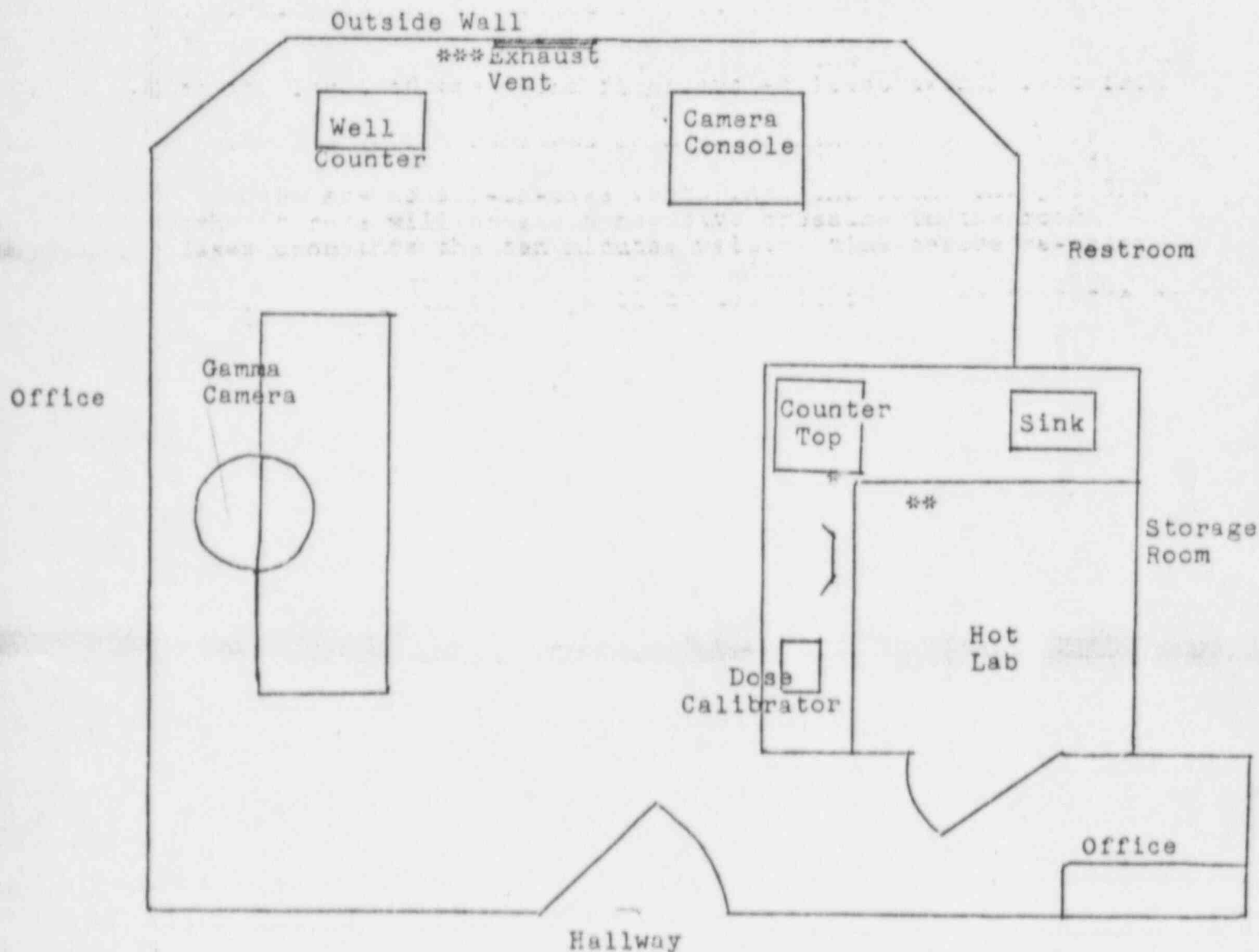
monitor. A replacement cartridge will be installed when the trap's exhaust reaches 1.0 MPC. The "Xen Alert" room air/trap monitor will be calibrated according to the manufacturers instructions annually.

The ventilation system will be checked to determine that it is operating according to the specifications by the use of a velometer at least semiannually.

The exhaust vent will be located at the side of the building at the level of the third floor and at least twenty feet from any air intake or windows that open.

The charcoal cartridges from the Xenon trap will be sealed in a plastic bag and stored until it is decayed and may be disposed off.

There are no air-in-take vents into the room. The 300 CFM exhaust rate will create a negative pressure in the room. Based upon this the ten minutes waiting time before re-entry into the room is reason able. In addition a low level GM survey meter or the "Xen Alert" will be used to determine that the room is safe to re-enter.



*Isotope Storage Area. All radioactive materials will be stored behind lead bricks.

** Waste Storage Area. All radioactive waste will be stored under the counter top with proper lead shielding.

*** Xenon Exhaust Vent. The exhaust rate is 300CFM above the intake rate. There are no air intakes within 12 feet of the exhaust vent.