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NUCLEAR MEDICINE
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April 15, 1985

John Madera
U.S. Nuclear Regulatory Commision
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137

RE: Control # 77312

Dear Mr. Madera:

In response for further information concerning Item #21 of our license renewal application, please find enclosed a revised room diagram and a revised Xenon Radiation Safety program.

If you desire further information, please contact me or our consultants, Nuclear Medicine Associates, at (216)641-5799.

Sincerely,

John A. Gantz, M.D.

nmg

ITEM #21

PROCEDURES AND PRECAUTIONS FOR USE OF RADIOACTIVE GASES

1. Quantities to be used:
   a. Patient Information
      1. One study per month
      2. 20 mCi per study
   b. Posession Limit: 100 mCi

2. Use and storage areas
   The imaging room is used for the storage and use of xenon. (See diagram).

3. Procedures for Routine Use
   a. The dose will be prepared and assayed in the dose calibrator if possible. Shielding of the dose will be maintained at all times up to patient administration, except during identification and assay. Patients will be instructed as to the procedure and trial runs will be conducted if at all possible. Finger badges and whole body badges will be worn by all personnel handling Xenon. The camera room door will be closed.

   b. Face masks or mouthpieces along with a Xenon rebreathing apparatus will be employed (Atomic Products Disposable Systems 060-133 or equivalent). The face mask covers both mouth and nose. A nose clamp will be employed with the use of a mouthpiece. Tubing and valves will be inspected prior to use to assure continuity. The bag will be held in position next to the patient with the use of an IV pole or equivalent.

   c. Air flow measurements will be taken semi-annually to verify exhaust rates as stated, and to assure negative pressure in the camera room with respect to the hallway.

4. Concentration in Restricted Areas
   a. The air handling system of the camera room exhausts at a rate of 800 cfm. No air is recirculated in the building. Supplies to the room will be dampered (if necessary) to achieve negative pressure in the room.

   b. Activity (A)= 20,000 uCi per month.
   Loss Factor (f)= 20% (patient associated losses).

c. Room Volume= 24' x 13' x 8' = 2496 cu. ft.
2496 cu. ft. x 2.832 x 10^4 ml/cu ft. x 800 cfm x 16 hrs x 60 min/hr = 5.4 x 10^{13} ml.

Concentration(C)= (A x f)/V

$$C = \frac{20{,}000 \text{ uCi/month} \times 0.20}{5.4 \times 10^{13} \text{ ml}} = 7.3 \times 10^{-11}$$

5. Emergency Procedures

a. In the event a dose of xenon is accidentally released into the camera room, the room will be evacuated until levels have reduced to 1 x 10^{-5} uCi/ml. Removal of personnel will be effected if the patient's condition permits. The time required for this evacuation is described below:

Assume 100% loss to the room.
Activity= 20 mCi = 20,000 uCi
Room Volume= 2496 cu ft= 7.07 x 10^7 ml
Initial Concentration (Co)= 20,000 uCi/7.07 x 10^7 = 2.83 x 10^{-4} uCi/ml

Clearance Rate (CR)= 800 cfm/2496 cu ft. = .3205 per minute

Concentration= Co $e^{-CR \times t}$
1 x 10^{-5}=2.83 x 10^{-4} x $e^{-.3205 \times t}$

t = 11 minutes

Prior to re- entry, a measurement will be made using a low level G-M survey meter near the floor. A reading equivalent to background shall be considered as evidence that the ventilation has cleared the room of xenon as calculated.

6. Concentrations in Unrestricted Areas

On-time =

$$\frac{20{,}000 \text{ uCi/study}}{800 \text{ cfm} \times 3 \times 10^{-7} \text{ uCi/ml} \times 2.83 \times 10^{4} \text{ ml/cu ft} \times 60 \text{ min/hr}}$$

On-time = 50 hours

Therefore, for each study, the fan will remain on for 50 hours.

7. Disposal of Xenon

After each study, the xenon collected in the bag will be expelled out the exhaust fan. The bag will be collapsed into the exhaust fan by the technologist.
When the bag is surveyed and found to be background, the bag may be disposed of to routine trash.

Facilities and Equipment

Diagram

Air Supply

Air Exhaust

__ Scanner
9 Uptake/Well
1 Camera
2 Lockable Door
3 Receipt Area
4 Generator
3 Kit Preparation
6 Isotope Storage
3 Dose Preparation
6 Waste Storage
7 Dose Calibrator
8 Refrigerator

Adjacent Areas

A Hall
B Restroom
C Exterior
D Stairwell
E Storage
F Mechanical Room

Sink

Lead Castle

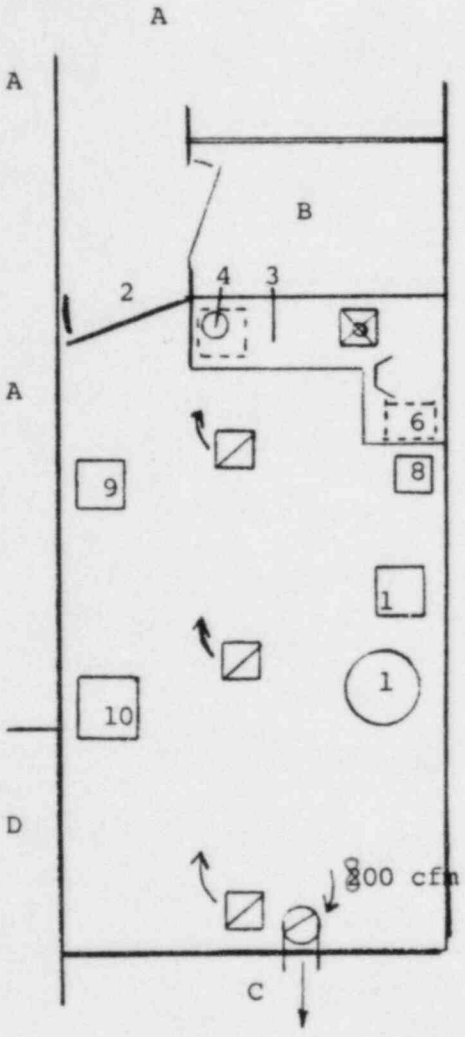
Lead Shielding

6 Old generator shield Ultrashield #024
8"L x 10"W x 14"H x ½"T

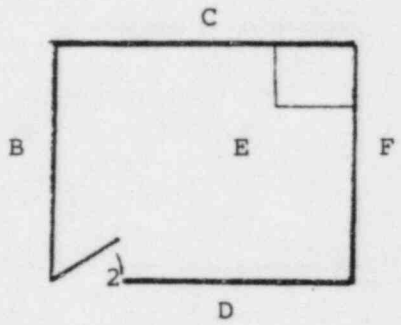
6 Waste storage
8"L x 10"W x 8½"H x ½"T

__ __L x __W x __H x __T

__ __L x __W x __H x __T



First Floor



Basement

Item #11
3 of 3 pages
Prepared 4-5-85
Lic. #24-09769-01

CONVERSATION RECORD

TIME 10@ | DATE 3/28/85

TYPE: ☐ VISIT ☐ CONFERENCE ☒ TELEPHONE ☐ INCOMING ☐ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU	ORGANIZATION (Office, dept., bureau, etc.)	TELEPHONE NO.
David B. Hess, RSO.	Nuclear Medicine, Ltd	314/644-7100

SUBJECT: Xenon procedures @ Nuclear Medicine, Ltd.

ROUTING	
NAME/SYMBOL	INT

SUMMARY

① What considerations have been made for uniformity of exhaust in each area of the clinic.

a.) How can you be sure Xe-133 will not be exhausted into an area of lower exhaust and be pooled up.

② Submit the imaging area volume and the volume of the entire clinic - with diagrams - showing exhaust in each area

③ Submit your emergency procedures - worst case - 20 mCi spill.

④ Submit procedures for checking vent system checks throughout clinic on a semi-annual basis.

⑤ Submit your procedures for safely expelling bag to outside. Who will perform and where will this procedure take place.

ACTION REQUIRED

⑥ Describe Xenon-133 apparatus

NAME OF PERSON DOCUMENTING CONVERSATION	SIGNATURE	DATE
	J K Mode	3/28/85

ACTION TAKEN

SIGNATURE	TITLE	DATE