

April 24, 1985

U. S. Nuclear Regulatory Commission Region 1
631 Park Avenue
King of Prussia, Pennsylvania 19406

Attention: John E. Glenn

RE: Mail Control 03574
Docket No. 030-21231

Gentlemen:

Please find enclosed, the additional information you requested to process our license application dated March 21, 1985.

Please replace the existing pages (Rev. 0) with the new pages (Rev. 1).

A brief explanation of the changes I have made for Revision 1:

Page 8-9 Added 520 hours of on-the-job training

Page 8-10 Change (c)(1)(a) to show only RSO will conduct training

Page 8-11 Change requirements in III D.3

Page 8-12 Change requirements as listed on Page 8-11

Page 8-30 thru 8-47 Change tests and answer sheets for assistant radiographer and radiographer to required number of questions

Page 9-1 thru 9-6 Added additional information requested on exposure room and storage vault

Page 10.4-8 Added dosimetry storage when not in use

Page 10.4-27 Added information requested to 5.2 C1

Page 10.4-45 Changed 6.2 E and F to use only the vehicle for source storage

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APR 26 1985

U. S. Nuclear Regulatory Commission Region 1
Attn: John E. Glenn

April 24, 1985
Page 2

Page 10.4-46 Deleted 6.2 G and changed H to G
Page 10.4-48 Corrected typographical error in 7.2E
Page 10.4-53 Change information in 8.6 D on D.O.T. placards
Page 10.4-57 Added paragraph 11.1 to answer your comment "K"

I wish to note that in the test questions, I address Gamma Industries equipment over Technical Operations as my plans are to purchase Gamma Industries equipment at the present time. When I purchase Technical Operations equipment, instruction and test questions will be added to reflect this equipment.

If I can be of further assistance, please contact me.

VECTOR CORPORATION

TECHNICAL SERVICES DIVISION



EDWARD HANDRAHAN
Radiation Safety Officer

III.

A radiographer shall:

- a) be at least 18 years of age
- b) have completed form NRC 4
- c) have at least 520 hours of on-the-job training as a radiographer's assistant without any violation of radiation safety procedures
- d) have completed all training required for radiographer's assistant set forth in Section IV and demonstrate his proficiency in the subject matter by written and oral examinations as well as practical demonstration of routine and emergency radiological safety procedures. Examinations for proficiency in radiographic techniques will be conducted by the RSO. Examinations in radiological safety will be conducted by the RSO.
- e) be designated as a radiographer in a probationary status for 6 months. Upon completion of 6 months without any violation of radiological safety procedures or license conditions, he shall be designated as a fully qualified radiographer.

3. Radiographer's Assistant

A radiographer's assistant is any individual who, under the personal supervision of a radiographer, uses radiographic exposure devices, sealed sources or related handling tools or survey instruments in radiography. Qualifications for designation as radiographer's assistant are as follows:

A radiographer's assistant shall:

- a) be at least 18 years of age
- b) have completed form NRC 4
- c) have observed radiographic operations as a trainee for at least one month
- d) have completed the 520 hours of on-the-job training and proficiency requirements for radiographer's assistant as set forth in Section IV of this manual.

4. Trainee

A trainee is any individual assigned to the radiographic department for training who is not yet qualified as a radiographer's assistant or higher. Requirements for employment as trainee are:

III.

A trainee shall:

- a) be at least 18 years of age
- b) have completed form NRC 4
- c) completed all training requirements, as set forth in Section 4 for designation as a radiographer's assistant within three months after designation as a trainee.

C. Responsibilities for Training

1. Radiation Safety Officer

- a) Schedule, arrange and conduct training as required in this manual.
- b) Schedule and conduct:
 - 1. Proficiency examinations in radiographic technique.
- c) Arrange for radiological safety qualifying examinations as required.
- d) Certify qualification and designation of radiographers and radiographer's assistants upon completion of the requirements of this manual.

2. Radiographers

Radiographers shall:

- a) Assist as requested by the RSO in presenting certain demonstrations and discussions as part of the "on the job" training of assistants and trainees toward completion of training requirements.
- b) Assist the RSO in presenting practical training sessions in radiographic technique, preparation of radiation records, and radiological safety practices as directed by the RSO.
- c) Assist in testing and certifying proficiency of trainees and assistants in radiographic technique and procedures as directed by the RSO.
- d) Conduct all radiographic operations in such manner as to exemplify safe radiographic procedure.

III. D. Procedures for Qualification and Designation

1. General Procedures

Each person assigned to the radiographic department shall maintain up-to-date training and proficiency records reflecting the status of his qualifications. This record shall also be maintained in the RSO's files and removed only to make entries thereon. After completion of a training requirement, the individual concerned shall obtain his record from the RSO and have the requirement certified by the individual designated as responsible for certification.

2. Designation for Higher Classification

When an individual has met all requirements for the next higher classification, the RSO shall conduct the radiological safety examination for that classification, and upon certification of satisfactory performance in the examination, the RSO shall designate the individual as qualified for the higher classification on the form set forth in Appendix A of this manual.

3. Qualifications Completed Prior to Employment

If an individual has qualified as a radiographer with another employer, the RSO may, at his discretion, waive such of the formal training requirements as have, in his judgment, been completed previously. The experience requirements and radiological safety examination shall not be waived. Regardless of prior training and/or experience, all newly hired radiation personnel will receive as a minimum four to six hours of formal classroom training in Vector Corporation's Operating and Emergency Procedures, two to four hours of instruction in the use of the radiography equipment, successful completion of the written and practical (field) radiography examinations.

4. Qualification for Use of New Equipment

If, within the license or amendment thereto, the company acquires new radiographic equipment, all radiographers shall be trained in accordance with Section IV of the Training Course prior to using such equipment.

Qualification on new equipment shall be entered on each man's qualification record by the RSO.

IV. INITIAL TRAINING

Initial training of each radiographer or assistant radiographer will be completed and/or documented during the 30 day probationary period following assignment to radiography operations. Each man's training must total a minimum of 40 hours of formal training or proof therefore in those subjects listed in Appendix A of 10-CFR-34.

The RSO will evaluate each radiation worker's radiography experience and documentation of radiation safety training in order to determine which radiation job category (e.g. radiographer, assistant radiographer, or radiography trainee) the individual qualifies for. This decision shall be made in writing specifically stating the job classification and recommending such additional training as may be required to qualify for higher classifications. A copy of the findings along with any written examination, documentation from former employers and copies of radiological safety training certificates shall be made a part of the worker's personnel file to be maintained by the RSO. Appendix A contains a sample form which will be used to document each person's training.

Regardless of prior experience, each radiation worker will receive as a minimum four to six hours of formal classroom training in Vector Corporation's Operating and Emergency Procedures, two to four hours of instruction in the use of radiography equipment, successful completion of the written and practical (field) radiography examinations. The training will be given by the Radiation Safety Officer.

Each radiation worker must maintain his own procedures manual, a complete copy of this training manual, NRC and applicable state regulations along with a copy of our current NRC License. The RSO will test each radiation worker by written, oral and practical examinations to assure acceptable degrees of understanding of radiation safety and demonstrated ability to comply with applicable NRC and state regulations. Every newly hired employee assigned to radiation work must provide certain details on previous training and experience with radiation. Typical forms used for this information are shown in Appendix B.

APPENDIX C

ASSISTANT RADIOGRAPHER'S EXAMINATION

WRITTEN FINAL GRADE _____ %

FIELD EXAM FINAL GRADE _____ %

PASSING SCORE: 80%

NAME _____ SOC. SEC. NO. _____

DATE OF BIRTH _____ PRESENT CLASSIFICATION _____

DATE ASSIGNED TO RADIOGRAPHY _____

DATE EXAMINATION COMPLETED _____

EXPERIENCE

1. Where is a film badge to be worn?
 - a) Any where it will pick up radiation.
 - b) It is not necessary to wear a film badge.
 - c) In a back pocket.
 - d) Upper front torso between the belt and neck.
2. Who must wear a film badge?
 - a) It is not required for a radiographer's assistant to wear a film badge.
 - b) Only the radiographer in charge.
 - c) Only trainees
 - d) All radiographers, assistants and trainees.

3. A radiographer's assistant may wear anyone's film badge as long as he has one during radiographic operations.

True

False

4. When must dosimeters be charged and recharged?

1)

2)

5. What is the procedure for recharging a dosimeter pencil?

1)

2)

3)

4)

5)

6. List the procedure if a dosimeter is damaged or goes off scale.

a)

b)

c)

7. Where is a dosimeter to be worn?

a) Dosimeters may be worn anywhere it will pick up radiation.

b) In the back pocket.

c) It is not necessary for a radiographer's assistant to wear a dosimeter.

d) In the same location as required for the film badge.

8. A dosimeter must be capable of detecting radiation of at least 200 millirems.

True

False

9. Describe the operations performed before using a Victoreen 492 Survey Meter.
- 1)
 - 2)
 - 3)
 - 4)
 - 5)
10. List the name and phone number of your Radiation Safety Officer.
- Name _____
- Plant Phone No. _____
11. Name 3 types of the most common materials used to reduce radiation intensities.
12. Define the Inverse Square Law.
13. Describe how to survey an Iridium 129 Camera prior to starting radiography operations.
14. Describe the survey during radiographic operations.
15. At the restricted area boundary, the radiation limit must not exceed _____ regardless of the duration of exposure.
16. No radiographic device shall be used which is not within the prescribed _____ leak test period and has been found to be free of radioisotope leakage in excess of _____ microcuries.
17. When is an assistant radiographer permitted to make changes in Vector Corporation's Operating and Emergency Procedures?

18. Describe in detail how to set up a Gamma Industries exposure device.

19. A film badge is to be worn:

- a) one year
- b) one week
- c) one month
- d) 3 months

20. A Victoreen 492 Survey Meter must be calibrated at intervals not to exceed:

- a) 6 months
- b) 1 year
- c) 1 month
- d) 3 months

21. Describe "restricted area".

22. Describe "radiation area".

23. Describe "high radiation area".

24. If your survey meter is not working properly, you can always check the area with a dosimeter to see if radiation is present so radiography operations can continue.

True

False

25. An area monitor can be used in place of a survey meter since both measure radiation.

True

False

Appendix C

ASSISTANT RADIOGRAPHER'S FIELD EXAMINATION

1. Show how to properly inspect a survey meter prior to use.
2. Set up a gamma century SA Camera, survey site and post-required signs and ropes.
3. Show steps to be taken after last shot of the day.
4. Your dosimeter is off scale. Show steps to be taken.
5. Show your duties if a source is disconnected in the guide tube.

APPENDIX D

ANSWERS TO ASSISTANT RADIOGRAPHER'S EXAMINATION

- 1) D
- 2) D
- 3) False
- 4)
 - 1) Daily prior to beginning week
 - 2) If reading exceeds half scale
- 5)
 - 1) Insert dosimeter pencil into charging socket
 - 2) Hold dosimeter pencil in contact
 - 3) Turn large knob on charger to adjust dosimeter pencil to zero
 - 4) Remove dosimeter from charger and check hairline position
 - 5) Hairline should be set to zero or as low as possible prior to radiographic operations.
- 6)
 - A) Stop operations immediately
 - B) Notify R. S. O.
 - C) Return film badge for immediate reading
- 7) D
- 8) True
- 9)
 - 1) Check instrument service record for calibration
 - 2) Perform battery check
 - 3) Turn to zero position and adjust needle to "0"
 - 4) Turn selector to lowest range and make certain needle returns to "0"
 - 5) Turn selector to another range check that it returns to "0"
- 10) Edward Handrahan
412 687-7100
- 11) Lead
Steel
Concrete
- 12) As the distance is doubled, the radiation is reduced to 1/4 the original level.
- 13) Survey the surface of the device 360° around at 6" distance and between length of guide tube and record reading on survey and utilization record.

- 14) With survey meter at its proper selector setting, survey all boundaries of the area.

Make adjustments in the perimeter to maintain radiation levels at 2 mR/hr or less.

Record results of survey on survey and utilization record.

- 15) 2 mR/hr
- 16) 6 months 005 microcuries
- 17) Never permitted
- 18) Survey exposure device prior to removing from storage area, position device where it will not fall or be damaged, remove cap from lock box, crank control cable out approximately 6", connect to pigtail, screw male connector into lock box, attach source tube to connector on front of device. Clear all personnel from area, post boundary at 2 mR limit. Maintain surveillance of area during exposure, retract source, survey camera 360° around and entire length of source tube, lock camera.
- 19) C
- 20) D
- 21) An area to which access is controlled for the purpose of radiation in which a person could exceed a dose of 2 mrem in any one hour or 100 mrem in any one week.
- 22) An area where a person could receive a radiation dose in excess of 5 mrem in any one hour or 100 mrem in any 5 consecutive days.
- 23) An area where the radiation dose to a person could exceed 100 mrem in one hour.
- 24) False
- 25) False

APPENDIX D

ASSISTANT RADIOGRAPHER'S FIELD EXAMINATION CHECK LIST

1. (a) Calibration date
- (b) Meter response
- (c) Battery condition or zero
2. (a) Camera survey and record
- (b) Daily check list and record
- (c) Leak Test
- (d) Survey meter calibration
- (e) Control cable assembly
- (f) Position source tube
- (g) Rope off and post signs at proper points.
- (h) Attach source tube, unlock and expose.
- (i) Readjust barrier if needed.
- (j) Retract source, check with meter, lock and survey -
 including guide tube.
3. (a) Remove key from lock.
- (b) Properly position safety plugs.
- (c) Survey device record results
- (d) Return to storage area - lock area.
4. (a) Survey area.
- (b) Notify R.S.O.
- (c) Turn in film badge - cease operations.
5. (a) Survey area - adjust barrier.
- (b) Help secure area - keep under surveillance.

APPENDIX E

RADIOGRAPHER'S SAFETY EXAMINATION

FINAL GRADE: _____ %

PASSING SCORE: 80%

NAME _____ SOC. SEC. NO. _____

DATE OF BIRTH _____ PRESENT CLASSIFICATION _____

DATE ASSIGNED TO RADIOGRAPHY _____

DATE EXAMINATION COMPLETED _____

EXPERIENCE

1. There are three (3) fundamental principles involved when controlling exposure to radiation. List the three (3) and give a brief description of how they protect you from receiving radiation.

(a)

(b)

(c)

Define the following terms:

2. "half-life" -
3. Curie -
4. Roentgen -
5. Dose -
6. Dose rate -
7. Restricted area -
8. Inverse Square Law -

MATCH

- | | | | |
|-----|-------|--|----------------------------|
| 9. | _____ | Half life period for ^{60}Co | A. 3 months |
| 10. | _____ | The gamma dose rate of 100 Ci of ^{192}Ir at 2 feet is | B. greater than 2 mR/hr. |
| 11. | _____ | half life period for ^{192}Ir | C. greater than 5 R/hr. |
| 12. | _____ | a dosimeter pencil measures | D. 9 months |
| 13. | _____ | an exposure device must be leak tested every | E. 14.5 R/hr. |
| 14. | _____ | the range of your survey meter for industrial radiography | F. greater than 5 mR/hr. |
| 15. | _____ | the gamma dose rate of 1 Ci of ^{60}Co at 1 foot is | G. dose rate |
| 16. | _____ | a survey meter must be calibrated every | H. 5.9 R/hr. |
| 17. | _____ | survey meter measures | I. 148 R/hr. |
| 18. | _____ | if a survey meter has a check source, it must be leak tested every | J. less than 2 mR/hr. |
| 19. | _____ | a milliroentgen is how much of a roentgen? | K. 75 days |
| 20. | _____ | radiation area | L. 30 days |
| 21. | _____ | restricted area | M. greater than 100 mR/hr. |
| 22. | _____ | unrestricted area | N. 1.25 years |
| 23. | _____ | high radiation area | O. 1/10,000 |
| | | | P. radiation received |
| | | | Q. 1 mR to 1R |
| | | | R. 0.5 mR to 5R |
| | | | S. 2.7 inches |
| | | | T. 5.25 years |
| | | | U. greater than 100 R/hr. |
| | | | V. 6 months |
| | | | W. 1/1,000 |

24. What is the purpose of a Strontium 90 source in a survey meter?
25. What would you do if during radiographic operations on a field project, you discovered your survey meter was not working?
26. Describe exactly at what intervals you utilize your survey meter after arriving at a radiographic assignment.
27. When a survey meter is removed for radiographic operations, how do you know that the instrument has been calibrated within the required limits?
28. What are the required range limits per NRC Regulations that your survey meter must be able to detect radiation?
29. Describe in detail, exactly what steps must be taken after your exposure time has elapsed when using a remote exposure device.
30. Describe how you would make an exposure with a Gamma Century exposure device.
31. Why is it necessary to survey the front (source tube side of unit) after each exposure? Explain in detail.
32. How often must a radioisotope be leak tested and what are the required limits of contamination?

33. How do you secure an exposure device on a field radiographic project when going to lunch?
34. How do you know the activity of your radioisotope in your exposure device?
35. Vehicles hauling radioactive materials:
 - (a) What type warning signs are required?
 - (b) Where should they be placed?
 - (c) What is the maximum allowable radiation outside your vehicle?
36. What would you do if you dropped your film badge near a source while your exposure was in the "ON" position, and what must you do in the event that you do not discover it until the exposure has been completed?
37. What action would you take if you knew your source was loose in the source tube?
38. What would you do if your dosimeter pencil went off-scale during radiographic operations, and you were 200 miles away from your home office?
39. What is the range of your dosimeter pencil and where must it be worn?
40. Do your procedures permit you to leave a restricted area unattended during an exposure?

41. Your radiation survey meter reads 10 mR/hr. How much dose will be delivered in 15 minutes?
42. List the daily inspection required for a Gamma Industries Century Camera:
- 1.
 - 2.
 - 3.
 - 4.
 - 5.
 - 6.
 - 7.
 - 8.
 - 9.
43. When must a package containing radioactive material be labeled with a radioactive yellow II sticker?
- a) When the dose rate at 3 feet does not exceed 1 mR/hr.
 - b) When the dose rate at the surface does not exceed 50 mR/hr.
 - c) You are never permitted to use a yellow II sticker for radiography sources.
 - d) Both A and B are correct.
44. When must the D.O.T. "RADIOACTIVE" placards be placed on a vehicle containing radioactive material?
- a) Whenever the package requires a yellow III label.
 - b) Any time any quantity of radioactive material is carried in a vehicle
 - c) Whenever a yellow II or a white I is used.
 - d) Placards are never required.
45. Define the term "transport index".

46. The radiation dose limit for whole body exposure is:
- a) 1-1/4 rems per quarter if NRC-4 form is not up to date.
 - b) 3 rems per quarter if lifetime dose does not exceed 5(N-18).
 - c) 5 rems per quarter if you are under 40 years of age.
 - d) Both A and B above are correct
47. In accordance with Vector Corporation's Operating and Emergency Procedures, a radiographer is permitted to change a source without the direct supervision of the Radiation Safety Officer.

True

False

48. Periodic inspection of the exposure device will be performed at intervals not to exceed:
- a) 30 days
 - b) 60 days
 - c) 90 days
 - d) 1 year

49. What are the half life periods for the following:

Iridium 192 _____

Cobalt 60 _____

50. List the name and phone number of your Radiation Safety Officer.

Name _____

Plant Phone No. _____

APPENDIX F

ANSWERS TO RADIOGRAPHER'S SAFETY EXAMINATION

- 1) a) Time - the less time you are near the source, the less radiation you will receive.
b) Distance - the further away the less radiation you will receive.
c) Shielding - the more you are shielded from the source, the less radiation you will receive.
- 2) Half life - the period of time in which a given quantity of a specific radioactive isotope will decay to an activity equal to one half ($1/2$) of the original activity.
- 3) Curie - the unit of activity for measuring the quantity of a radioactive material.
- 4) Roentgen - a unit of radiation dose.
- 5) Dose - the amount of radiation absorbed by an object expressed in units of roentgens, rems or rads.
- 6) Dose rate - a measure of how fast a radiation dose is being received. It is a dose per unit of time.
- 7) Restricted area - an area to which access is controlled for the purposes of radiation protection in which a person could exceed a dose of 2 mrem in any one hour at 100 mrem in any one week.
- 8) Inverse Square Law - as the distance is doubled, the radiation is reduced to $1/4$ the original level.
- 9) T
- 10) I
- 11) K
- 12) P
- 13) V
- 14) Q
- 15) E

- 16) A
- 17) G
- 18) V
- 19) W
- 20) F
- 21) B
- 22) J
- 23) M
- 24) Strontium 90 is used as a check source to determine if meter is capable of detecting ionizing radiation.
- 25) Stop all operation.
Check dosimeter pencil for radiation exposure.
Make sure survey meter is not working.
Notify R.S.O. for replacement meter.
- 26) Prior to operations
After each exposure
When assignment is completed, survey vehicle.
- 27) The survey meter should have a calibration sticker indicating last calibration date and date calibration is due.
- 28) 2 mR/hr to 1 R/hr.
- 29) Turn crank counter clockwise until the source is returned to the camera survey exposure device 360° around and guide tube for entire length, lock camera.
- 30)
 - 1) Post restricted area and high radiation area.
 - 2) Remove safety plug from lock box.
 - 3) Crank control cable to a length of approximately six (6) inches.
 - 4) Connect the Saf-T-Key couplings on control cable and source pigtail.

30) (con't.)

- 5) Crank control cable in so male connector can be screwed into lock box.
 - 6) Connect source tube to source side of camera.
 - 7) Unlock unit and crank clockwise to expose source.
 - 8) Maintain surveillance of restricted area boundary adjusting to maintain 2 mR/hr limit.
 - 9) After exposure time lapsed, crank counterclock wise to stop position, survey camera and source tube, lock camera.
- 31) The source may not be fully retracted into the camera.
- 32) Every 6 months, 0.005 microcuries.
- 33) Lock the source in the camera, lock the camera inside the vehicle.
- 34) Decay curve or 75 day half life.
- 35) A) D.O.T. "RADIOACTIVE"
B) All 4 sides
C) Maximum outside vehicle 2mR/hr
- 36) Stop operations immediately, contact R.S.O., send film badge in for immediate processing, obtain new film badge and make a statement of facts.
- 37) Return to the control cable and turn the hand crank clockwise and counter clockwise trying to bring the pigtail back into the unit. If this is not successful, then the area should be secured and posted as a restricted area, maintaining continuous surveillance of the restricted area. Call the R.S.O.
- 38) Cease operations, notify R.S.O.
- 39) 0 to 200 Mr, upper front torso between belt and neck along with film badge.
- 40) No
- 41) 2.5 Mr

- 42) 1. Inspect cables for cuts, breaks and broken fittings.
2. Inspect crank for damage and loose hardware.
3. Check operation of cable connection.
4. Check operation of control for freedom of source movement.
5. Inspect source tube for cuts, crushing and broken fittings.
6. Inspect shield for damage to fittings, lock fasteners and labels.
7. Safety plugs in place.
8. Survey for excessive radiation levels.
9. Any impairment of locking mechanism.
- 43) D
- 44) A
- 45) Dose rate in Mrem per hour at 3 feet away from the surface of a package containing radioactive materials.
- 46) D
- 47) False
- 48) C
- 49) Iridium 192 -- 75 days
Cobalt 60 -- 5.3 years
- 50) Edward Handrahan
412 687-7100

ITEM 9

Sketch of
Facility and
Safety Equipment

N

ULTRASONIC
LAB

ISOTOPE
ROOM

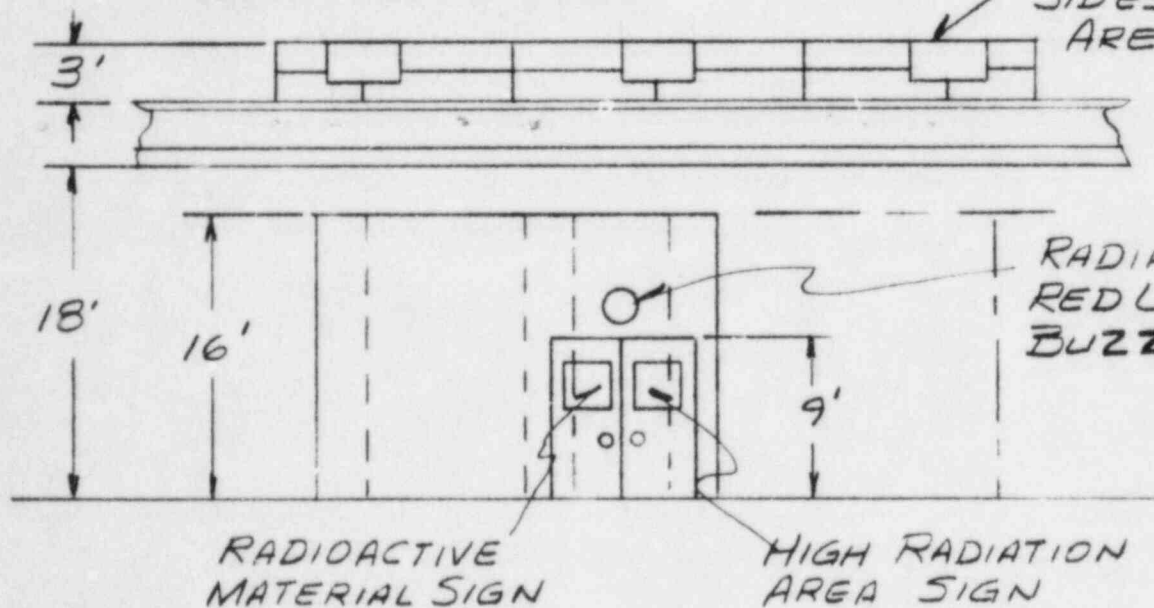
X-RAY
ROOM

RADIATION
AREA
(NO ACCESS
TO ROOF)

PLAN VIEW

5.62 R/HR 2' FROM
FLOOR 100 CU CO60

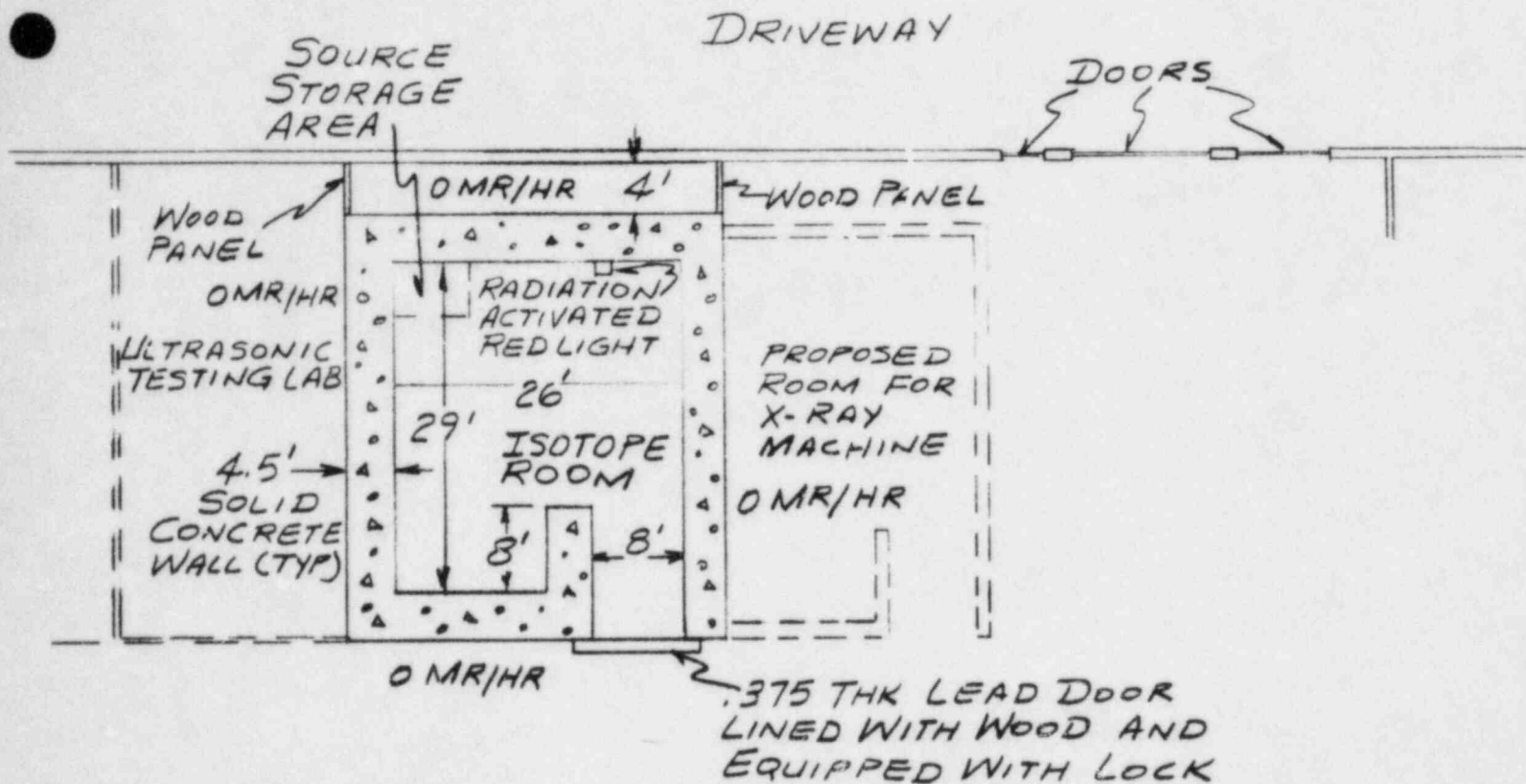
SIGNS AND BARRIER
TYPICAL ALL FOUR
SIDES OF RADIATION
AREA.



RADIOGRAPHIC EXPOSURE ROOM
(RADIO ISOTOPES)

493 NIXON RD CHESWICK, PA. 15024

N



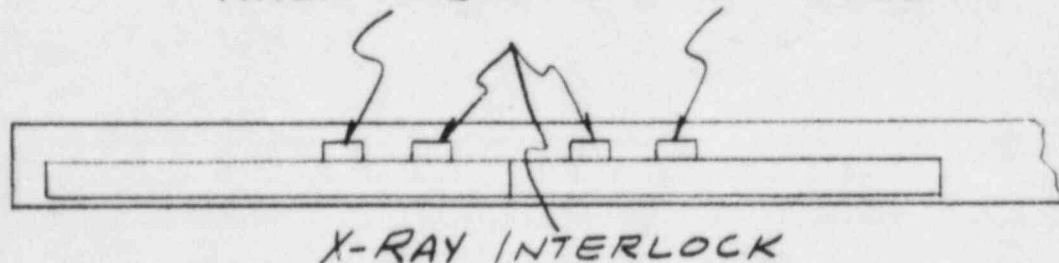
4.5' CONCRETE (130 # CU FT)

HALF VALUE LAYER = 3" FOR C060

1440 R @ 1' FOR 100 CU C060

.0003 MR/HR AT OUTER SURFACE OF WALL (0 MR/HR)

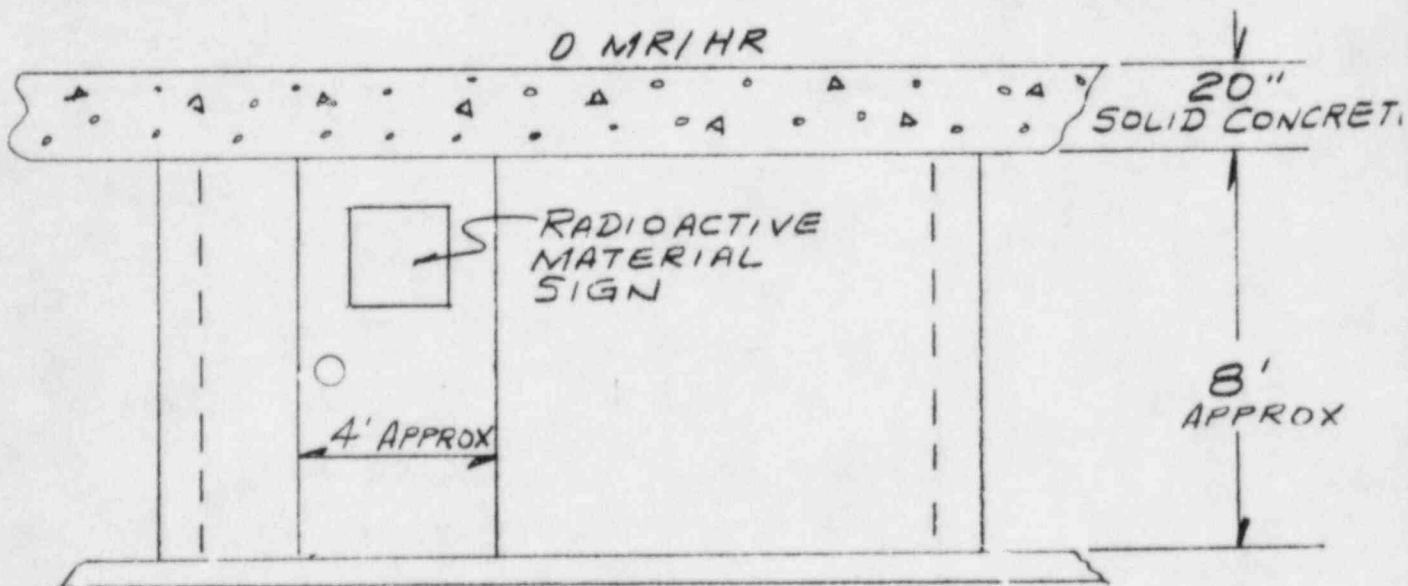
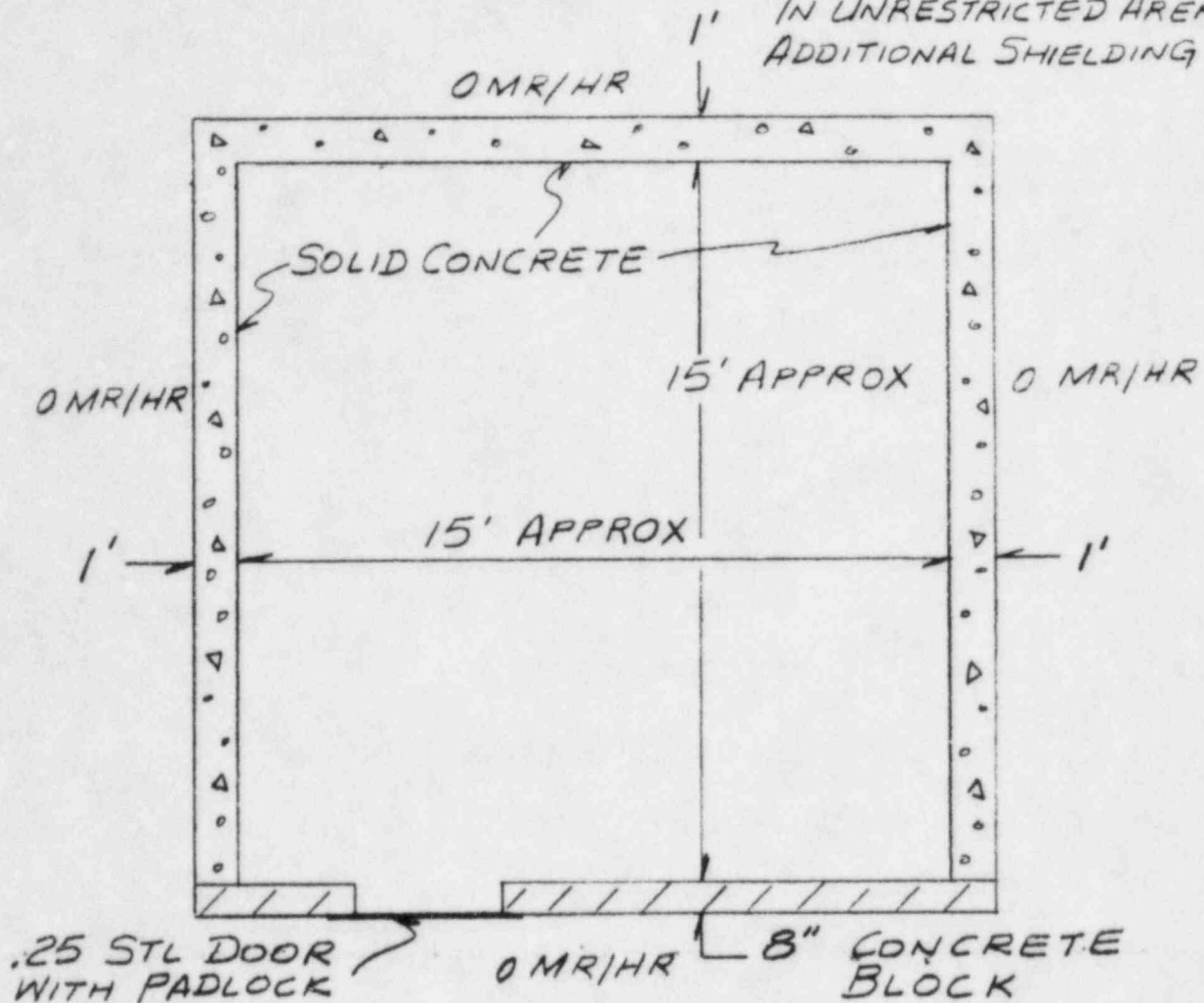
RADIATION ALARM SWITCHES FOR
AUDIBLE SIGNAL IF DOOR IS OPENED
WHEN RADIATION IS PRESENT



RADIOGRAPHIC EXPOSURE ROOM (RADIO ISOTOPES)

493 NIXON RD CHESWICK, PA. 15024

RADIATION DOSE RATE
WILL BE MAINTAINED AT 0 MR/HR
IN UNRESTRICTED AREA BY
ADDITIONAL SHIELDING IF REQ'D.



TEMPORARY
RADIOISOTOPE STORAGE VAULT

3700 BUTLER ST
PGH PA 15201

Primalert™ 10 Therapy Monitor



Primalert™ 10

If a therapy system malfunctions, its controls may falsely indicate a safe condition even though the source/beam is on. The Primalert 10 provides a dependable means of alerting personnel to such a hazard. It emits an alarm when the radiation level exceeds a preset value (2.5 or 20 mR/hr) selected by a front-panel switch. Bright red lamps flash on and off until safe conditions are restored. Since the system is activated by scattered radiation, it may be mounted anywhere in the room.

A flashing green "Operation Indicator" light continuously monitors the background radiation and provides visible proof that the instrument is functioning. In high radiation fields (over 1000 R/hr), the unit will not jam and continues to alarm. The Primalert 10 can also be used with the optional remote alarm (Primalarm).

105000 "Primalert 10" Radiation Monitor

Additional Specifications

The Primalert 10 utilize GM tube detectors; the alarms feature auto-reset. Each unit includes a self-tick bracket for wall-mounting. Power is 105-125 VAC, 60HZ, 10W (220 VAC, 50HZ on request); size is 6" H x 3.5" W x 1.5" Thick.

Primalarm Remote Alarm



Primalarm

Primalarm

The Primalarm, when connected to the Primalert 35 or 10, duplicates their warning signals up to 100 feet away. The alarms also go on if the cable connection to the Primalert breaks or disconnects or if power to the Primalert is lost. A green light indicates that the Remote Alarm is functioning. A switch on the front panel turns off the audible alarm, if desired. Includes 100-foot cable 6" x 3 1/2" x 1 1/2", 1 lb.

106000 "Primalarm" Remote Alarm

Rewire audible switch circuit so in off position interlock switches will energize alarm when radiation present and door is open. Use separate switches for this as X-ray interlock functions opposite to these.

ITEM 9

Technical Services, a division of Vector Corporation, proposes to use a vault at our current facility at 3700 Butler Street, Pittsburgh, Pennsylvania 15201 to store radiographic sources until our shielded room is constructed at our new facility at 493 Nixon Road, Cheswick, Pennsylvania 15024. The sources will be used at various field sites throughout the United States.

When the exposure room is completed the sources will be stored and operated in the exposure room as well as field sites.

The N.R.C. will be advised when the move is made so they may inspect the operations at the new facility.

The vault at 3700 Butler Street is a safe and secure storage facility to store radiographic sources and will be under the direct daily control of the radiation safety officer with access limited to him or radiographers designated by him.

The vault will be secured with a padlock at all times sources are not being removed or placed into the vault for storage.

2.5 Dosimeter Pencil Calibration Procedure

Dosimeters will be calibrated at least once annually for response to radiation using a dosimeter calibrator Model 3060. Dosimeters must calibrate within $\pm 30\%$ of actual radiation output of calibrator.

- 1.) Place dosimeter into one of the four (4) inner holes in the calibrator for six (6) hours. Record reading. Should read 50 mR $\pm 30\%$.
- 2.) Zero dosimeter. Replace in inner holes of calibrator. Expose for 18 hours. Dosimeter should read 150 mR $\pm 30\%$.
- 3.) Zero dosimeter and place away from any source of radiation for 24 hours. Dosimeter should not drift more than $2\% \pm 1\%$ in 24 hours.
- 4.) Record all readings on Dosimeter Calibration Record Form (Figure 2.02).

2.6 Dosimetry Storage

- 1.0 Dosimeters and film badges will be stored in the testing laboratory office in the rack provided along side the person's name plate at the end of the person's shift.
- 2.0 At field sites, a place away from radiation and heat will be designated by the radiographer in charge of the field operation and all radiographic personnel will be informed of the location.

- 5.2 B. 4. Determine where the control unit will be positioned (as far away from the radiographic focal position as possible and preferably behind a radiation shield) and lay out the control housing with no bend radii less than 36 inches.
5. Connect the control unit to the exposure device.
6. Before operation, check all connections and bend radii, and check the position of the source stop, which represents the radiographic focal position of the source.
7. Check the operation of the survey meter by reading the radiation level 6 inches from the surface of the exposure device. It should read no more than 50 mR/hr. for a 100 curie Iridium 192 source.
8. Unlock the exposure device lock and rotate the selector ring to the OPERATE position. The source is now free to move.

C. OPERATION

1. Clear all personnel from the area and post appropriate radiation warning signs as shown in Section 4 of this manual.

Return to the control unit. Adjust the odometer reset knob to obtain a 000 reading on the odometer.

2. Recheck to be sure that no unauthorized personnel are inside the Restricted Area.
3. Rapidly rotate the crank in the EXPOSE (counter-clockwise) direction to move the source to the radiographic focal position. The survey meter should read about full scale (1000 mR/hr.) for a 100 curie Iridium¹⁹² source when the source first leaves the exposure device, drop gradually as the source is driven to the radiographic focal position, and remain steady during the exposure. The survey meter readings will be substantially reduced if the meter is operated behind a radiation shield or if a collimator is used.
4. When the source reaches the source stop, the hand crank will stop turning. Never exert more than 5 ft-lbs of torque on the hand crank, as this may cause damage to the control unit or drive cable. The odometer reading will indicate the total distance the source has traveled (approximately 7 ft. for one source guide tube section, 14 ft. for two source guide tube sections, and 21 ft. for three sections). Set the brake to ON to prevent movement of the source during the exposure.

6.0 METHODS AND OCCASIONS FOR LOCKING AND SECURING RADIOGRAPHIC EXPOSURE DEVICES AND STORAGE CONTAINERS

6.1 General Information

All radiographic exposure devices and storage containers are provided with suitable locks or locking devices to prevent unauthorized or accidental removal of the radioactive material. The exposure devices or X-ray machines must be kept locked at all times, except when under the direct supervision of a radiographer or his assistant.

6.2 Locking and Securing

- A. During radiographic operations, the exposure device must be locked and surveyed after each exposure. The survey limits must not exceed those listed in Section 3.4, C.
- B. Upon completion of radiographic operations, the exposure device must be locked, safety plugs inserted and secured in its proper storage container and the container locked (providing the exposure device has a storage container).
- C. The device or storage container will then be locked in the transporting vehicle while returning the device to its permanent storage area.
- D. After returning the exposure device or storage container to its permanent storage area, the storage area will be locked.
- E. Vehicles will be used for storage areas overnight, and the exposure device and storage container must be locked and then locked in the vehicle. The keys must be kept in the possession of the radiographer. In the event it is necessary to secure the source by locking it in the truck of a car or body of a truck, sufficient shielding must be provided so that maximum radiation levels on the surface of the vehicle or enclosure will not exceed 2 mR/hr. The exterior of the vehicle will be identified by posting the D.O.T. placards "Radioactive" on all 4 sides when required.
- F. In the course of field work with radioactive materials, it is necessary at times to temporarily leave work site to process film, discuss interpretations, etc. In those cases, the exposure device must be locked and locked in the vehicle. The vehicle keys will be in the possession of the radiographer. When required, D.O.T. placards "Radioactive" will be placed on all 4 sides

G. In-Plant Storage

A radioisotope storage area is provided for the safe storage of the exposure device. The storage area must be posted with the warning signs containing the words, "CAUTION-RADIOACTIVE MATERIAL". The exposure devices must be returned to the radiographic storage vault when operations are completed. The entrance to this area must be kept locked at all times.

- 7.2 C. No radiographic device shall be moved unless it is locked and all safety plugs are properly inserted. All exposure devices must be locked in their storage containers.
- D. The remote operated radiographic devices and source changers used by Technical Services are provided with their own shipping containers and need not be crated, but must be properly positioned in the transporting vehicle and firmly secured by the use of ropes, straps or blocks so as to avoid bouncing, sliding or other movements.
- E. A radiation survey must be conducted on the outer surfaces of the vehicle to assure that radiation levels do not exceed 2 mR/hr.
- F. A radiation survey must be within the passenger compartment to assure that radiation levels are not above 2 mR/hr. If necessary, lead or concrete shielding should be secured around the device or storage container to reduce radiation levels to 2 mR/hr. or less.
- G. The exterior of the transporting vehicle must contain the placard "Radioactive" when required by DOT Regulations. This placard must appear on all of the four sides of the vehicle and must meet the requirements of DOT. This placard is to warn passersby and emergency crews that radioactive material shipments are in the vehicle. The placard will alert emergency crews to the need for taking appropriate precautions in case such vehicles are involved in accidents.
- H. Except when a vehicle containing an exposure device is under the direct surveillance of the radiographer or the assistant radiographer, it shall be kept locked at all times.
- I. Keys to exposure devices, storage containers and the vehicle shall be retained by the radiographer during the transportation of exposure devices.
- J. If overnight stops are required enroute, the vehicle should not be parked on main thoroughfares.
- K. In the event of a road accident involving the transporting vehicle, the instructions in Section 8.6 must be followed.

- 8.6 C. Upon arrival of local law authorities, describe the conditions that exist and have them control your Radiation Area until you have notified your Radiation Safety Officer, giving him complete details and have received instructions for corrective action.
- D. If survey instrument has been damaged and a visual examination detects any indication of damage to the source or source container, the vehicle shall be isolated and arrangements made to secure an operable survey instrument. In any event, locate an operable survey meter before entering the radiation area. Colleges, hospitals and State Health Departments have survey instruments available that can be borrowed or rented in case of an emergency. If this accident occurs on a turnpike or expressway, traffic must be routed around the vehicle at a safe distance depending on the type of isotope and its strength. Local authorities must be cautioned about the hazards that could develop by curious bystanders loitering near the vehicle.

Assuming that you are unconscious, the warning signs on the vehicle will advise the general public and local authorities that you are hauling radioactive material. We must assume that the local authorities are trained to handle a situation of this nature and will take the necessary action to apply medical aid for your protection. This is the importance of placing signs on the vehicle: (such as D.O.T. placards "RADIOACTIVE") to warn them of the potential hazards involved.

If the radioactive material you are hauling has been locked and secured as prescribed by this document, then this should minimize the danger of the source becoming loose or free from its prescribed storage container.

8.7 Unauthorized or Accidental Entry to Restricted Area

- A. Immediately remove person or persons from Restricted Area and to not permit any individual to re-enter the area again.
- B. Notify Radiation Safety Officer and give complete details.
- C. Gather all facts pertinent to the accident and be ready to present them to the proper persons. This should include names, addresses and telephone numbers of all persons suspected of having been in the radiation area.

11.1

Labeling of Packages for Shipment of Radioactive Materials

- A) Each package of radioactive material, unless excepted, must be labeled on 2 opposite sides, with a distinctive warning label. There are 3 types of labels for shipment of radioactive material:

1) Radioactive - White I

This label has an all white background and indicates that the external radiation level is low and no special handling is required. The maximum radiation level at package surface is less than 0.5 millirem per hour.

2) Radioactive - Yellow II

This label has the upper half of the label yellow and the lower half white. This designates that the external radiation level may require consideration during transport. This label is used when the radiation level at package surface is 0.5 to 50 millirem per hour.

3) Radioactive - Yellow III

This label has the upper half of the label yellow and the lower half white. This designates that external radiation level will require consideration during transport. This label is used when the radiation level at the package surface exceeds 50 millirem per hour. Any vehicle containing a radioactive yellow III package must be placarded on all four sides "RADIOACTIVE".

- B) No package will be submitted to a common carrier without the R.S.O. checking the shipment for compliance with proper regulations. Shipping papers to common carriers will only be signed by the R.S.O.

Shipping papers for shipments on company trucks to field sites can be signed by the radiographer in charge of the job assignment.