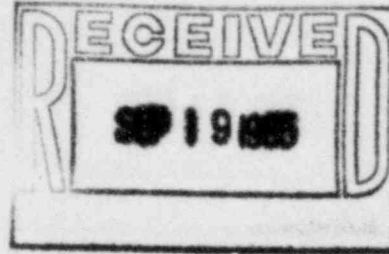




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AMERICAN FOUNDRY GROUP, INC.

14602 SOUTH GRANT • BIXBY, OKLAHOMA 74008 • (918) 585-9285

September 17, 1985



Nuclear Regulatory Commission-Region IV
Parkway Central Plaza Building
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011

ATTN: Mr. Jack E. Whitten

Dear Mr. Whitten

We are enclosing the revised training program requested by your letter of July 10, 1985. This is listed under your Control Number 460602.

Upon approval this section will replace Section 6F in our Emergency and Operating Procedures.

Should you have any questions, please let us know.

Sincerely,

James F. Hamilton
Radiation Safety Officer

JFH/km

encl: 2 copies of Oklahoma Steel's Training Program

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STAINLESS STEEL

NON-FERROUS

INVESTMENT

460602

6F TRAINING PROGRAM FOR RADIOGRAPHERS AND ASSISTANT RADIOGRAPHERS

The training program for radiographers and assistant radiographers is shown in this section of the Oklahoma Steel Casting Emergency and Operating Procedure. The program is used as a guide for training for the actual classroom work with samples of tests to be given included in the section. All requirements of Appendix A to 10CFR Part 34 are met by this training program.

1. Assistant Radiographers

For individuals without previous training and experience to be designated as a radiographer's assistant, the following training will be provided:

A. Instruction in the Oklahoma Steel Casting Emergency and Operating Procedure. Classroom training to be at least **4 hours**.

B. Instruction in and demonstrated competence, under the personal supervision of a radiographer, the exposure devices, sealed sources, related handling tools and radiation survey instruments that he will be using. Instruction shall be a minimum of **4 hours**.

C. Training of assistant radiographer is the responsibility of the Chief Radiographer and the Radiation Safety Officer who will conduct the actual classroom and practical training. Resumes of the current Chief Radiographer and Radiation Safety Officer are included at the end of this section.

D. Individuals with previous training shall demonstrate knowledge of the Emergency and Operating Procedures and use of radiographic equipment to the satisfaction of the Radiation Safety Officer and complete the written examination similar to the one shown in E below.

E. Sample test with answers to be given prior to being designated assistant radiographer. Passing grade is 70 percent. If 70 percent is not achieved re-instruction in the form of 2 hours classroom work over the questions missed and a period two weeks on-the-job-training before retesting will be required.

ASSISTANT RADIOGRAPHER EXAMINATION:

1. What are the 2 rules of most importance when operating a source?
(Have a calibrated survey meter, know where source is at all times)
2. Is Oklahoma Steel an NRC licensing agreement State? (No)
3. The vault walls are poured concrete but what thickness? (B)
 - a) 36"
 - b) 48"
 - c) 42"
4. What should you do if you suspect the limitations of the license are exceeded by a source in our possession? (B)
 - a) Notify the manufacturer
 - b) Notify the Radiation Safety Officer
 - c) Notify the NRC
5. The maximum permissible dosage while operating the source crank handle is 2 mr in any 1 hour or 200 mr in any seven consecutive days - True or False?
(True)
6. Survey meters are to be calibrated (C)
 - a) At least every 45 days or after any repairs are made
 - b) At least every 2 months or after any repairs are made
 - c) At least every 3 months or after any repairs will be made

7. A physical survey of the unrestricted area of radiation will be made (A)
 - a) Once each day, or when source positions warrant
 - b) Once each week, or when source positions warrant
 - c) Once each month, or when source positions warrant
8. The rules to follow are: Use survey meter on LX scale, about 5' from ground, at about 10' from vault and about 20' from vault on all sides and if reading is greater than 2 mr/hr, notify the Radiation Safety Officer and secure the area, while determining necessary changes to be made. True or False? (True)
9. The gamma alarm system is set at: (B)
 - a) 1 mr/hr
 - b) 2 mr/hr
 - c) 2 r/hr
10. There are three (3) sets of keys issued to the exposure vault door. True or False? (True)
11. There are only two (2) keys issued for each isotope camera. True or False? (True)
12. In the event of fire or tornadoes in the exposure area the Radiation Safety Officer should be contacted. True or False? (True)
13. Every six months the Radiation Safety Officer will review the applicable provisions of NRC Title 10 with operating personnel. True or False? (True)
14. The two (2) forms required for employee accumulated dosages and periodic dosages are: (B)
 - a) NRC-3 and NRC-4
 - b) NRC-4 and NRC-5
 - c) NRC-5 and NRC-6
15. The actual cleaning and lubrication, after three months of service (cameras) will be performed by: (A)
 - a) Radiographer
 - b) Camera Sales Representative
 - c) Chief Radiation Safety Officer
16. Should a record of repairs, including parts, of this service be maintained? Yes or No? (Yes)
17. Our Co⁶⁰ camera was manufactured by: (B)
 - a) Automation Industries
 - b) Technical Operations
18. In an extreme emergency would it be permissible for us to compile radiation levels, rope off or seal off an area to safe limitations and made an "open field exposure: Yes or No? (No)
19. Why should an unshielded source never be positioned more than six (6) feet from the ground while making an exposure in the vault? (C)
 - a) Danger of damage to equipment
 - b) Set up time involved
 - c) Danger of radiation and sky-shine on exterior of vault
20. The reasons to check for actual sources location after each exposure is: (D)
 - a) It is a good safety habit
 - b) Oklahoma Steel's license requires this
 - c) This is a requirement set forth by NRC
 - d) All of the above
21. Who must maintain direct surveillance of a radiographic operation? (A radiographer)
22. What are the three (3) principal ray emissions from radioactive material? (Gamma, Alpha, and Beta)
23. What does a survey instrument measure? (Radiation level in mr/hr)
24. When should surveys be taken of the unrestricted area of our facility? (At least once a day at the start of each shift)
25. What does a dosimeter measure? (Amount of radiation received)

2. Radiographer

For an individual to be designated as a radiographer, the individual will have the following training and experience:

A. Approximately 40 hours classroom instruction. The classroom instruction will be given by one of the following: Technical Operations, Louisiana University (LSU) of Capital X-Ray of Tulsa, Oklahoma. Instructions for Tech-Ops and LSU are provided from the staffs of the respective institutions. Capitol X-Ray uses George Johnson as the instructor. His qualifications include 20 years as Radiation Safety Officer Capitol X-Ray and 10 years as Educational Chairman for the Oklahoma Chapter of ASNT.

Topics to be covered in the classroom training are from Appendix A to 10CFR Part

34:

1. Fundamentals of Radiation Safety -(Approximately 12 hours)

- a) Characteristics of gamma radiation.
- b) Units of radiation dose(mrem) and quantity of radioactivity (curie)
- c) Hazards of exposure to radiation.
- d) Levels of radiation from licensed material.
- e) Methods of controlling radiation dose.
 - 1- Working Time
 - 2- Working Distance
 - 3- Shielding

2. Radiation Detection Instrumentation to be Used- (Approximately 10 hours)

- a) Use of radiation survey instruments.
 - 1- Operation
 - 2- Calibrations
 - 3- Limitations
- b) Survey techniques.
- c) Use of personnel monitoring equipment.
 - 1- Film badges and thermoluminescent dosimeter (TLD's)
 - 2- Pocket dosimeters

3. Radiographic Equipment to be Used -(Approximately 10 hours)

- a) Remote handling equipment.
- b) Radiographic exposure devices.
- c) Storage containers.

4. Inspection and Maintenance Performed by the Radiographers - (Approximately 5 hours)

5. Case Histories of Radiography Accidents - (Approximately 3 hours)

B. A minimum of 3 months (520 hours) of on-the-job-training as a radiographer's assistant. The on-the-job-training will be conducted under the direct supervision of a radiographer.

C. At the completion of training a 50 question test concerning the topics of Appendix A to 10CFR Part 34 and the Emergency and Operating Procedures will be given. 80% is required for a passing grade. A full examination will be given at the end of the on-the-job-training to determine if individual is competent to perform all assigned operations. 80% is required for a passing grade. Should an individual fail either examination he will be required to be retrained in the areas he is deficient. After a period of 30 days he may again be tested.

D. Sample of Radiographers test with answers:

RADIOGRAPHERS EXAMINATION:

1. Who must maintain direct surveillance of a radiographic operation?
(Radiographer)
2. In the event of an accident involving sealed sources at OSC, what should you do? (Clear vault lock door and notify R.S.O.)
3. If a survey meter being used becomes inoperable, what are the procedures to be followed? (Stop work obtain another calibrated survey meter before proceeding)
4. What are the three principal ray emissions from radioactive material?
(Alpha, Beta, and Gamma)
5. A Curie of any radioisotope is defined as how many disintegrations per second? (3.7×10^{10} disintegration/sec)
6. What are the emission constants of the following radioisotopes?
 - a) Co^{60} (14.4 r/hr ci at 1 ft.)
 - b) Ir 192 (5.9 r/hr ci at 1 ft.)
7. What are the three principal means that must be applied for controlling body exposure to radioactive materials? (Time, distance, and shielding)
8. What does a survey instrument measure? (Radiation rate or radiation intensity)
9. What does a dosimeter measure? (Radiation dose)
10. What does a film badge measure? (Radiation dose)
11. When should a survey instrument be calibrated? (Every 90 days or when damaged)
12. When should a film badge be checked? (Monthly or when suspected exposure)
13. When should a dosimeter be checked? (End of a shift or when suspected exposure)
14. Who keeps a record of dosimeter readings? (Chief Radiographer)
15. When should surveys be taken of the unrestricted area of our facility?
(Once a day at start of work)
16. When should the cameras in the exposure vault be surveyed? (Each time the vault is entered)
17. Can film badges and dosimeters be transferred from one person to another? (No)
18. At what interval must a radiographic source be leak tested? (90 days)
19. The REM & M-REM are measures of what? (Roentgen equivalent man, absorbed dose multiplied to biological factor)
20. Define Restricted Area: (Any area to which access is controlled by license)
21. What are the documents that the employer must supply to each radiographer and assistant radiographer? (Operating and Emergency Procedure, NRC 4 and 5)
22. Can we calibrate our own survey meters? Give reason for your answer.
(No, we do not have capability and license does not permit)
23. The following is required to be posted in or near the exposure area?
(The NRC Regulations, License, Operating and Emergency Procedures, NRC Office locations)
24. You must notify the NRC within 24 hours upon whole body exposure to _____ REM's? (5 REM)
25. Define Radiographer. (Individual who performs radiography and is responsible for compliance with the license)
26. What are the two (2) rules of most importance with operating a source? (Have calibrated survey meter)
27. Is Oklahoma on NRC Licensing agreement? Yes or No (No)
28. The vault walls are poured concrete but what thickness? (B)
 - a) 36"
 - b) 48"
 - c) 42"

29. What should you do if you suspect the limitations of the license are exceeded by a source in our possession? (B)
- Notify the manufacturer
 - Notify the Radiation Safety Officer
 - Notify the NRC
30. The maximum permissible dosage while operating the source crank handle is 2 mr in any seven consecutive days. True or False? (False)
31. Survey meters are to be calibrated (C)
- At least every 45 days or after any repairs are made
 - At least every 2 months or after any repairs are made
 - At least every 3 months or after any repairs are made
32. A physical survey of the unrestricted area of radiation will be made (A)
- Once each day, or when source positions warrant
 - Once each week, or when source positions warrant
 - Once each month, or when source positions warrant
33. The rules to follow are: Use survey meter on LX scale, about 5' from ground, at about 10' from vault on all sides and if reading is greater than 2 mr/hr, notify the Radiation Safety Officer and secure the area, while determining necessary changes to be made. True or False? (True)
34. The gamma alarm system is set at: (B)
- 1 mr/hr
 - 2 mr/hr
 - 2 r/hr
35. There are 3 sets of keys issued to the exposure vault door. True or False? (True)
36. There are only 2 keys issued for each isotope camera. True or False? (True)
37. In the event of fire or tornadoes in the exposure area the Radiation Safety Officer should be contacted. True or False? (True)
38. Every six months the Radiation Safety Officer will review the applicable provisions of NRC Title 10 with operating personnel. True or False? (True)
39. The 2 forms required for employee accumulated dosages and periodic dosages are: (B)
- NRC-3 and NRC-4
 - NRC-4 and NRC-5
 - NRC-5 and NRC-6
40. The actual cleaning and lubrication, after three months of services (cameras) will be performed by: (A)
- Radiographer
 - Camera Sales Representative
 - Chief Radiation Safety Officer
41. Should a record of repairs, including parts, of this service be maintained?
Yes or No? (Yes)
42. Our Co⁶⁰ camera was manufactured by: (B)
- Automation Industries
 - Technical Operations
43. In an extreme emergency would it be permissible for us to compile radiation levels rope off or seal off an area to safe limitations and make an "open field" exposure?
Yes or No? (No)
44. Why should an unshielded source never be positioned more than 6 feet from the ground while making an exposure in the vault (C)
- Danger of damage to equipment
 - Set up time involved
 - Danger of radiation and sky-shine on exterior of vault
45. The reasons to check for actual source location after each exposure is: (D)
- It is a good safety habit
 - Oklahoma Steel's license requires this
 - This is a requirement set forth by NRC
 - All of the above

46. Who may operate the Isotope equipment at Oklahoma Steel Castings Company?
(Only licensed radiographers)
47. Define an emergency situation in vault. (When source cannot be returned to camera without exposed to radiographer or any other situation where danger of exposure exists.)
48. We can exceed the maximum cure strength by what percentages? (C)
 a) 20% for Co⁶⁰ and 10% for Ir 192
 b) 10% for Co⁶⁰ and 20% for Ir 192
 c) 10% for Co⁶⁰ and 10% for Ir 192
49. Form NRC-3 has been posted in 3 places at the Nuclear Department, they are: (B)
 a) Overhead shop door, vault door and front gate
 b) Office wall, shop wall and vault door
 c) Vault door, vault wall and door of storage room
50. The Victorene 492, survey meter, has three scales for radiation monitoring and requires no protection from rain or when the temperature is below -32°F. True or False? (False)

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 E. The field examination will be conducted using the internal checklist shown below:

Internal Inspection Checklist

Radiographic Location _____ Date _____ Time _____
 Radiographer _____ Inspector _____
 Radioisotope _____ Curies _____ Serial no. _____
 Projector Serial no. _____ Projector Serial no. _____
 Survey Meter Model no. _____ Serial no. _____ Calibration Due _____

Yes or No

1. Was the radiographer wearing a film badge and dosimeter?
2. Were other individuals working within the restricted area wearing film badges and dosimeter?
3. Was the restricted area posted with "CAUTION" (or DANGER) RADIATION AREA" signs?
4. Was the restricted area properly controlled to prevent unauthorized entry?
5. Was the high radiation area posted with "CAUTION (or DANGER) HIGH RADIATION AREA" signs?
6. Did the radiographer have a calibrated and properly operating survey meter?
7. Was the utilization log properly filled out?
8. Did the radiographer have sufficient knowledge of safety rules? (Ascertained by oral questions)
9. Was the radiographer working with defective equipment?
10. Did the radiographer properly survey the source projector and source tube and take a radiation reading 1 foot (0.3 m) in front of the source following the radiographic exposure?
11. Were radioactive isotopes stored properly and kept locked to prevent unauthorized removal?
12. Was the storage area posted with "CAUTION (or DANGER) RADIOACTIVE MATERIAL" signs?
13. Did the radiographer possess a copy of the applicant's operating and emergency procedures and, as applicable State or NRC rules and regulations for protection

Yes or No

14. Were there any items of noncompliance other than those listed on this form?
(If any, explain in remarks)

Remarks _____

F. For an individual who has been a radiographer for another license, the training will as a minimum be the same as that of an assistant radiographer except that he will be required to take the radiographers written examination and field examination.

3. Periodic Training

The Radiation Safety Officer will conduct training for Radiographers and Assistant Radiographers semi-annually and will cover the following:

- A. New regulations, procedures, policies and equipment.
- B. Case histories of accidents with use of isotopes.
- C. Continuing proficiency with present equipment and procedures.
- D. Oklahoma Steel's safety record.

4. Resume of Individuals Responsible for Training at Oklahoma Steel Castings Company

Jim Hamilton - Radiation Safety Officer

Qualifications: BS Metallurgy, University of Missouri at Rolla. Twenty-two (22) years experience in all phases of steel foundry, including Radiation Safety Officer at Missouri Steel Castings. Graduate of LSU course on Radiation Safety in 1972. Four (4) years experience in nuclear safety requirements in U.S. Army. Presently Technical Director at Oklahoma Steel Castings. Seven (7) years as Radiation Safety Officer at Oklahoma Steel Castings.

Equipment Used: 250 KV General Electric X-Ray Unit; 100 Curie I-192 and 100 Curie Co⁶⁰ in Gamma Industries; Utility Twin Camera. Also has received instruction and is familiar with standard operating procedures of Oklahoma Steel Castings facilities.

Jack W. Pate - Chief Radiographer

Qualifications: Graduate of Hickory High School; Hickory, Oklahoma. Radar Training and Experience - U.S. Navy three (3) years; Blue print reading course in Tulsa, Vocational Technical School, 1971; Graduate of Kodak School of Industrial Radiography, November 1973, with ASNT Level II; Graduate Diano (Picker) Isotope for Industrial Radiography School, December 1973. Radiographer for 14 years at Oklahoma Steel Castings. Chief Radiographer since September 1975.

Equipment Used: 250 KV General Electric X-Ray unit; 250 KV Picker X-Ray unit; 300 KV Norelco X-Ray unit; 300 KV Phillips X-ray unit; 10 Curie Cobalt with Tech-op Model 500 Camera; 33 Curie Iridium with Tech-op Model 660 Camera; 886 Curie Cobalt 60 Cyclops unit; 26 Curie Iridium Tech-op 660 Camera; 99 Curie Cobalt 60 with Tech-op Model 500 Camera; 100 Curie Ir. 192 with Automation Industries Model 520 Camera.