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Route 3, Box 247Q
Duncan, Oklahoma 73533

July 25, 1987

United States Nuclear Regulatory Commission
Region IV
Nuclear Materials Licensing Section
611 Ryan Plaza Drive
Suite 1000
Arlington, Texas 76011

ATTENTION: Mr. Charles L. Cain, Chief

Re: Control No. 461306; Response to correspondence dated June 15, 1987.

Dear Mr. Cain:

This correspondence is in response to your above referenced correspondence and will assume the same format as the referenced correspondence.

Prior to preparing this response, it has been evident that all correspondence and mailing received from U.S. NRC has been addressed to "Oklahoma Tracers, Inc.". It is requested that "OK Tracers" also be approved for this license.

1. Training program for "Logging Supervisors" and "Logging Assistants" as defined in 10 CFR 39.2.
 - a. The individual that will be conducting all of the training, both classroom and on-the-job will be Dan G. Kelly. A resume for him is presently on file with NRC. Mr. Kelly worked for Halliburton Services from 1955 to 1986. During that time he worked with research and field activities performed by the Company under Radioactive Materials Licenses 35-00502-02, 35-00502-03 and 35-00502-04G, and earlier license numbers. From 1965 to 1974 Dan Kelly supervised the same activities and in 1974 was named Radiation Safety Officer under these license and coordinated all activities under these licenses until retirement in 1986.
 - b., c. & e. The course outline will be followed for instruction to "Logging Supervisors", "Logging Assistants" and individuals with previous well logging training (not provided by OK Tracers). The training will consist of a minimum of 40 hour classroom instruction. Verification of competency by written examination will be the same for all three categories. See Attachments #1 and #2 for the course outline and course written examinations.

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- d. See Attachment #3 for the "Field Performance Evaluation". It is a check list used by the RSO observing the performance of the Logging Assistants and Logging Supervisors. The field evaluation will be repeated until all points are performed correctly. No individual (Logging Supervisor or Assistant) will be permitted to perform tracer injections without the presence of the instructor until they have successfully completed the classroom and field performance evaluation.
 - f. Attachment #3 "Field Performance Evaluation" will be used as a guide for an Annual Safety review of all Logging Supervisors and Logging Assistants. The review will be conducted by the Radiation Safety Officer, Dan G. Kelly.
2. a. The radioactive waste to be held for decay will come from both the tracer operations and manufacturing process. All concentrated liquid or solid waste will be held indefinitely and separate from all other waste. There will be no commercial waste collection, only what is generated by OK Tracers. It is not fully understood what is meant by "inventory of waste", but no more than licensed quantities of any or all licensed isotopes will be held in stock or as waste simultaneously. If at any time the estimated inventory exceeds this figure it will be reduced by shipping the excess to a commercial facility.
- b. Controls for Environmental Pollution, Inc. will perform assays for all isotopes on randomly selected weight percentage portions of a drum of rad waste, only if the rad waste exceeds background surface readings as measured or surveyed by a Ludlum Model 14C using a Ludlum Model 44-7 GM probe and confirmed with a Model 14C using a Ludlum Model 44-2 NaI probe. Controls for Environmental Pollution, Inc. will analyze for all licensed isotopes and provide the results in microcuries per gram. These figures will be used to compute the total isotope content of the drum. If nothing unusual is found the drum will be held for further decay. If necessary the drum of waste will be disposed of by shipping to a licensed disposal or holding facility.

At the end of the holding period (10 half life minimum) the drum of rad waste will be surveyed by taking surface readings, completely covering the entire outer surface of the drum and through the center of the drum (see response 2.c.). The survey will be performed using a Ludlum Model 14C survey meter with a Model 44-7 GM probe and confirmed using a Model 14C with a Model 44-2 NaI probe. Survey meter readings equivalent to background will be considered non-radioactive and be treated as trash. Any drum having readings exceeding background will be retained in storage for further decay or sampled and submitted to Controls for Environmental Pollution, Inc. as described in the preceding paragraph.

- c. The drums used for waste storage will be ring-sealed and of fifty-five gallon capacity. The drums will be plastic lined to

help control contamination. A thin walled plastic tubing, having a diameter sufficient to accept a survey meter probe, will be placed in the center of the drum. The tubing will extend from the bottom to the top of the drum. This open-ended tubing will be used to permit interior surveys at the end of the holding period.

Rad waste will be physically dumped by hand into the drum from the container in which it was temporarily stored or transported. A heavy headed, long handled steel mallet will be used to compact the waste within the drum. No mechanical compaction will be used without future NRC approval. When the drum is full it will be ring-sealed, labelled and dated for storage.

The operator performing the rad waste transfer and compaction will wear protective clothing consisting of disposable gloves and apron or coveralls. A respirator will be worn to prevent dust inhalation.

- d. The following record or records will be maintained for each drum placed in rad waste storage and ultimately disposed of. These records will be kept on file until NRC permits their disposal.
 1. Numbered as indicated on drum and lid.
 2. Date placed in storage.
 3. Complete list of all radioisotopes. The radioisotope having the longest half life will be used for determining the holding period.
 4. The approximate weight of the drum and the contents.
 5. An estimate of the quantity (microcuries) of each isotope.
 6. The initial survey performed on the outer surface and interior of the drum.
 7. The final and any intermittent surveys performed on the drum.
 8. A description of the instrumentation and the calibration date used for each survey.
 9. The date of disposal of the waste.
 10. An accurate description as to where the disposal was made.
 11. Each and every document pertaining to the drum will be dated and signed by the Logging Supervisor or RSO.
3. It is our understanding that well-to-well injections for secondary recovery operations such as well flooding require individual license amendments based on pertinent data and characteristics. OK Tracers will not perform such injections without amendments and permission of NRC and/or local Agreement State.
4. The following survey instruments will be used for monitoring and physical surveys at each temporary well site where tracer is used.
 - a. Model 14C, Ludlum Measurements, Inc., Sweetwater, Texas.
 - b. Model 44-7 GM probe, Ludlum Measurements, Inc., Sweetwater, Texas.

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- c. Model 44-2 NaI probe, Ludlum Measurements, Inc., Sweetwater, Texas will be used as a backup.
- d. Model 2, Ludlum Measurements, Inc., Sweetwater, Texas.

These instruments are presently ready for use and will be used at every temporary well site. However, several manufacturers make comparable instrumentation and OK Tracers has no desire to be confined to a single manufacturer.

The survey meters will be calibrated by one of the following licensed firms.

- a. Ludlum Measurements, Inc., Sweetwater, Texas (Texas license).
 - b. Gulf Nuclear, Inc., Houston, Texas (Texas license).
 - c. Nuclear Sources and Services, Inc., Houston, Texas (Texas license).
 - d. W. H. Henken Industries, Arlington, Texas (Texas license).
- 5. The annual inspections of the job performance for each Logging Supervisor will be performed by the RSO, Dan G. Kelly and will include all items on Attachments #2 "Radiation Training Quiz Questions" and #3 "Field Performance Evaluation". These documents will be dated and signed by the RSO and maintained on file for at least three years to maintain compliance with 10 CFR 39.13(d).
 - 6. The NRC emergency telephone numbers in Section 10.1 of the OK Tracers draft of the "Operations and Procedures Manual" have been corrected as indicated in your referenced correspondence. The final publication will show the correct numbers.
 - 7. The word "Halliburton" in Section 8.1(c) of the manual has been corrected to "Oklahoma Tracers" and will be reflected in the final draft.
 - 8. Licensed material will be stored and used only at the facility in Duncan, Oklahoma. If additional locations become necessary in the future, an amendment request will be made prior to establishment and use of the location.
 - 9. Please amend the original application for amendment dated November 12, 1986, Section 8.7.14(A) to read; "No disposal of any material for which there is detectable activity, as measured by a survey meter, will be made".

Sincerely,

Dan G. Kelly

DGK/cdo
Attachments

ATTACHMENT #1
TRAINING COURSE OUTLINE

I. Structure of Matter 2 hours

- A. Atomic number of the elements
- B. Isotopes of the elements
 - 1. Protons
 - 2. Neutrons
 - 3. Electrons
 - 4. Non radioactive isotopes
 - 5. Radioactive isotopes
- C. Periodic Table of the Elements

II. Radiation 2 hours

- A. Units of Radioactivity
- B. Kinds of radiation
 - 1. Alpha
 - 2. Beta
 - 3. Gamma
 - 4. X-ray
 - 5. Neutron
- C. Properties of Radiation:
 - 1. Mass
 - 2. Change
 - 3. Description
 - a. Particle
 - b. Electromagnetic
 - c. Electron
 - d. Helium Nucleus
 - 4. Energy ranges
 - 5. Travel speeds
 - 6. Travel distances
- D. Electromagnetic spectrum
 - 1. Frequency
 - 2. Wavelength
 - 3. Speed
 - 4. Wave motion

III. Nuclear Reactions 2 hours

- A. Nuclear reactions
 - 1. Alpha decay
 - 2. Beta decay
 - 3. Gamma ray

- B. Units of Activity
 - 1. Curie (Becquerel)
 - 2. Disintegrations
 - 3. Subdivisions
- C. Decay
 - 1. Uranium-238
 - 2. $N=N_0 e^{-\lambda t}$
 - 3. Half Life
 - a. Decay constant
 - b. Various isotopes

IV. Interaction of Radiation with Matter

4 hours

- A. Ionization of Ions
 - 1. Electrical changes
 - a. Positive
 - b. Negative
 - c. Electrical balance
- B. Particles causing ionization
 - 1. Ionpairs
 - 2. Electron volt
 - 3. Effects of speed, mass and charge
- C. Ionization by Electromagnetic Radiation
 - 1. Gamma
 - 2. X-ray
 - 3. Penetration
 - 4. Energy transfer
 - a. Photo-electrical absorption
 - b. Compton scattering
 - c. Pair production
- D. Roentgen (coulomb/kg) (c/kg)
 - 1. Measures effects on air
 - 2. Ion pairs per cc
 - 3. Electrostatic unit
 - 4. Dose rate
 - a. r/hr
 - b. Subdivisions
 - 5. Dose rate Constants
 - 6. Inverse Square Law
- E. Radiation Absorption
 - 1. Alpha particles
 - 2. Beta particles
 - 3. Gamma ray
 - 4. X-ray -ut
 - 5. $I = I_0 e^{-\mu x}$
 - 6. Absorption coefficients

F. Half-Value layers (HVL)

1. HVL = $\frac{0.693}{\mu}$
2. Thickness
3. Density
4. Scattering
5. Buildup
6. Reduction factors
7. Reduction by shielding

G. Principles of Radiation Safety

1. TIME
2. DISTANCE
3. SHIELDING
4. Personnel exposure time
5. Working distances
6. Use of shielding

V. Radiation Detection and Measurement

8 hours

A. Detection

1. No human sensors
2. Instruments

B. Measurement (Instruction and Hands-on)

1. Dose
2. Dose rate
3. Roentgen
4. Dosimeters
5. Film Badges
6. Thermoluminescent Dosimeter (TLD)
7. Survey meters
8. Ionization Chamber Instruments
9. Geiger Counters and probes
10. Scintillation detectors
11. Instrument characteristics

VI. The Nature and Consequences of Radiation Exposure

4 hours

A. Radiological Health

1. Visual display of body injury from mishandling
2. Exposure in U.S. from natural sources
3. Background radiation

B. Measurement units of radiation doses

1. Roentgen
2. Rem
3. Rad
4. RBE

C. Effects of ionizing radiation on health

1. Dose rate effects
2. Age
3. Body part
4. Extent of body irradiated

5. Biological variation
 6. Location of radiation sources
 - a. External radiation
 - b. Internal radiation
 - c. Radiation effects
 7. Somatic effects
 - a. Cellular response
 - b. Organ sensitivity
 - c. Total body doses
 8. Genetic effects
- D. Levels and symptoms of radiation injury
1. Mild dose
 2. Moderate dose
 3. Strong dose
 4. Lethal dose
 5. Radiation sickness
 6. Radiation injury
 7. Radioactive poisoning
 8. Chemical poisoning
- E. Summary of effects
1. Acute
 2. Chronic
 3. Latent effects
 4. Damages
 5. Type damage
 6. Symptoms
 7. Recovery
- F. Personnel Monitoring
1. NRC Exposure limits
 2. Administrative limits
 3. ALARA
 4. Back account concept
 5. Instrumentation

VII. Tracer Services

4 hours

- A. Introduction
- B. Radioactive propping agents
- C. Tracer sand and other props
- D. Iodine-131
- E. Scandium-46
- F. Iridium-192
- G. Gold-198
- H. Lanthanum 148

- I. Zirconium-Niobium 95
- J. Sodium 24
- K. Silver 110^m
- L. Iron 59
- M. Cobalt 60
- N. Zinc 65
- O. Miscellaneous isotopes
- P. Applications
 - 1. Cementing
 - 2. Fracturing
 - 3. Fluid tracing
 - 4. Downhole markers
 - 5. Formation markers

VIII. Standard Procedure for Handling Radioactive Materials 4 hours

- A. Assignment of responsibility
 - 1. RSO
 - 2. Logging Supervisor or Logging Assistant
 - 3. Qualification
 - a. Classroom - 40 + hours
 - b. On-job - Approximately 3 months
- B. Procedure for performing radioactive services
 - 1. Part 19
 - 2. Part 20
 - 3. Part 39
 - 4. Operating procedures
 - 5. Emergency procedures
 - 6. Licenses and license conditions
- C. Personnel monitoring procedures
 - 1. Survey meter
 - 2. TLD
 - 3. Radioactive treatment report entries
- D. Records (maintained at office)
 - 1. Radioactive treatment reports
 - 2. Personnel exposure reports
 - 3. Parts 19, 20 and 39 of 10 CFR
 - 4. License and amendments
 - 5. Notices to employees
 - 6. Operating and emergency procedures
 - 7. Radiation survey instrument calibration records
 - 8. Physical inventory
 - 9. Storage records
 - 10. Radioactive treatment reports (utilization records)

11. Inspection records
12. Training records
13. Survey records
14. Violation records
15. Violation notice response
16. Occupations external radiation exposure histories
17. Shipping documents
18. All related correspondence

E. Field handling of radioactive material

1. Determine nuclide needed
2. Order isotope
3. Receiving procedures
4. Storing procedures
5. Removal from storage
6. Transporting isotope
7. Transport surveys
 - a. Pre transport
 - b. Post transport
 - c. In transit
8. Shipping document
9. Pre-use survey at job-site
10. Operator protection
11. Establishing radiation area
12. Injection
13. Control of waste and contaminated materials
14. Post-use survey
15. Transportation to office and storage
16. Disposition of waste and unused isotope
17. NO SMOKING, EATING OR DRINKING
18. Preparation of waste for storage handling

F. Job-site decontamination procedures

1. Isolation of area
2. Containment or abatement procedure
3. Survey, physical
4. Personnel clothing
5. Prevention of cross contamination
6. Clean up procedures
7. Waste containment and disposition
8. Verification by survey
9. Verification by assay when necessary
10. Reporting
11. Follow up procedures

IX. Packaging, Transporting and Storing Tracers

4 hours

A. Receipt of package containing isotope

1. Pickup
2. Securing
3. Monitoring during opening
4. Liquid receipts
5. Wipe tests and physical surveys
6. Records

- B. Packaging requirements
 - 1. DOT 7A containers
 - 2. Markings
 - 3. Labels
 - 4. Shipping papers
 - 5. Storing in containers
- C. Vehicle placarding
- D. Security during transport
- E. Storage facilities
 - 1. Design
 - 2. Security against unauthorized entry
 - 3. Proper signs
 - 4. Inventory control records
 - 5. Periodic surveys
 - 6. Wipe tests as necessary
 - 7. Reports
- X. Emergency Instructions 2 hours
 - A. Emergency assistance
 - 1. RSO
 - 2. NRC
 - B. Procedures to be followed in case of spillage
 - C. Procedures to be following in case of fire
- XI. TLD Badge Monitors 1 hour
 - A. RSO will assess need and order
 - B. Transfers
 - C. Terminations
 - D. Exchanging insert
 - E. Return used insert
 - F. Control badge
 - G. Exposure report
 - H. Lose of TLD
 - I. Instruction for wearing TLD

XII. Record Maintenance

8 hours

- A. License
- B. Operating and emergency procedures
- C. Regulations for control of radiation
 - 1. Title 10 CFR Part 19
 - 2. Title 10 CFR Part 20
 - 3. Title 10 CFR Part 39
 - 4. Part 39.61 (6 hours)
- D. Notice of violations
- E. Corrective action letters
- F. Personnel training records
- G. Personnel exposure records
- H. Employee termination or transfer notice
- I. Employee over exposure reports
- J. Lost/damage TLD reports
- K. Radioactive treatment reports
- L. Disposal records
- M. Storage records
- N. Material transfer reports
- O. Physical Inventory records (6 months)
- P. Inspection records
- Q. Survey records
- R. Annual employee testing and evaluation results
- S. Survey meter calibration records
- T. Bioassay records

XII. Bioassays

1 hour

- A. Iodine 131 50 mCi level
- B. Precautions
- C. Urine sampling

- D. Sample handling and shipment
- E. Bioassay results
- F. Response

XIII. Radioactive Treatment Report (RTR)

2 hours

- A. Must be taken in transport to job-site
- B. Prior to job-site
 - 1. Well information
 - 2. Material record
 - 3. Survey meter data
 - 4. Vehicle survey
 - 5. Passenger area survey
 - 6. Badge (TLD) number and identity
- C. Emergency information
- D. Isotope used
- E. Isotope quantity
- F. Isotope procurement
- G. Disposition of unused material
- H. Type of service performed
- I. Exposure data
- J. Pre job survey
- K. Post job survey
- L. Vehicle survey (post job)
- M. Physical radiation survey of delivery vehicle
- N. Survey of job area during injection
- O. Signature and TLD badge number
- P. Date of injection

ATTACHMENT #2
RADIATION TRAINING QUIZ QUESTIONS

1. The unit of activity is:
 - A. milliroentgen
 - B. millirem
 - C. millirad
 - D. millicurie
2. Iodine 131 emits what type(s) of radiation:
 - A. Gamma Rays and X-Rays
 - B. Beta and Gamma
 - C. Alpha and Gamma
 - D. Beta and Alpha
3. Iridium 192 emits what type(s) of radiation:
 - A. Gamma and Alpha
 - B. Neutron and Gamma
 - C. Protons and Electrons
 - D. Gamma and Beta
4. The half-life of Iodine 131 is approximately:
 - A. 75 days
 - B. 8 days
 - C. 84 days
 - D. 30 years
5. The half-life of Iridium 192 is approximately:
 - A. 75 days
 - B. 8 days
 - C. 84 days
 - D. 30 years
6. The half-life of Scandium 46 is approximately:
 - A. 75 days
 - B. 8 days
 - C. 84 days
 - D. 30 years
7. Which of the following isotopes can be used by OK Tracers for tracer studies:
 - A. Iridium 192
 - B. Iodine 131
 - C. Scandium 46
 - D. All of the above

8. If at one foot the reading from an unshielded can of Iridium 192 tagged sand was 59 mR/hr, how far would you need to retreat to be at the 2 mR/hr level?
- A. 4 feet
 - B. 5 feet
 - C. 5.3 feet
 - D. 7.1 feet
9. The inverse square law proves that if you increase your distance from a radioactive source your exposure will decrease substantially.

True or False

10. What is the quarterly allowable whole body dose?
- A. 3 Rem
 - B. 1.25 Rem
 - C. 5,000 mRem
 - D. 400 mRem
11. The instrument used to detect an ionization radiation exposure rate is the:
- A. Geiger Counter
 - B. TLD
 - C. Pocket Dosimeter
 - D. None of the above
12. Beta particle radiation is denoted as a skin dose on the personnel monitoring reports.

True or False

13. Gamma radiation is denoted as a whole body dose on the personnel monitoring report.

True or False

14. Personnel monitors (TLD) are exchanged:
- A. quarterly
 - B. monthly
 - C. semi-annually
 - D. annually
15. The three principles of radiation protection are _____, _____ and _____.

16. When using liquid Iodine 131 at what activity level would a bioassay be required?

- A. 10 mCi
- B. 25 mCi
- C. 50 mCi
- D. 5 mCi

17. What type of sample must be given for a bioassay?

- A. urine
- B. feces
- C. blood
- D. none of the above

18. Gamma rays are energy packets known as photons.

True or False

19. Geiger counters must be calibrated at what frequency?

- A. annually and after servicing
- B. quarterly and after servicing
- C. monthly and after servicing
- D. semi-annually and after servicing

20. Name two sources of naturally occurring radioactivity. _____ and _____

21. Sealed sources are to be leak tested every

- A. six months
- B. year
- C. 18 months
- D. 3 years

22. The storage location should be posted with signs that state
"_____".

23. What type of protective clothing must be worn when handling tracer radioactive material (bare minimum)?

24. Empty containers may be discarded at the job-site in the waste or reverse pit.

True or False

25. A radioactive Yellow II label may have a maximum exposure rate at 3 feet of:

- A. 1 mR/hr
- B. 10 mR/hr
- C. 100 mR/hr
- D. none of the above

26. The radioactive treatment report must be completed "as you go" or as readings are taken.

True or False

27. The source of radiation in the instrument calibrator is:

- A. Iridium 192
- B. Iodine 131
- C. Cesium 137
- D. Radium 226

28. When radioactive material is on something, that item is said to be _____.

29. The unit of exposure (radiation dose) is the

- A. Roentgen
- B. Rem
- C. Rad
- D. Curie

30. Liquid spills should be cleaned by:

- A. blotting
- B. wiping
- C. diluting
- D. evaporation

31. All spills must be cleaned to a removable exposure rate of:

- A. 0.1 mR/hr
- B. 2 mR/hr
- C. below background
- D. none of the above

32. Readings from naturally occurring sources of radiation constitute _____.

33. If you are involved in an accident on the highway and transporting radioactive material you should:

- A. check for injuries
- B. check the radioactive material container
- C. send someone for assistance if it is needed
- D. secure the area if a radiological hazard exists
- E. all the above

34. Radiation damage to the body is accumulative.

True or False

35. When "Yellow III" labeled containers are transported it is necessary to use "Radioactive" placards on all 4 sides of the transporting vehicle.

True or False

36. Tongs or other handling tools do not need to be used when only handling 1 or 2 cans of Iridium 192 tagged sand.

True or False

37.

MATCHING

- | | |
|--------------------------------|--------------------------------|
| — Iodine 131 (liquid) | A. Substitute to Iridium 192 |
| — Iridium 192
(tagged sand) | B. Used to tag frac proppant |
| — Scandium 46 | C. Good for cement squeeze tag |
| — Iron 59 | D. Cement Plug Marker |
| — Cobalt 60 | E. Collar Markers |
| — Iodine 131
(tagged sand) | F. Used to tag formation |
| — Iridium 192 (liquid) | G. Used in minifrac |

38. Radioactive placards are required on the transport vehicle when transporting containers having the following Label(s).

- A. Radioactive White I
- B. Radioactive Yellow II
- C. Radioactive Yellow III
- D. All of the above

39. Survey instrument calibration records must be retained on file for what period of time?

40. Physical inventories to account for all licensed material received and possessed must be conducted at what frequency?

- A. Monthly
- B. Quarterly
- C. Semiannually
- D. Annually

41. Personnel monitoring records must be retained on file for what period of time?

- A. Six Months
- B. Three Years
- C. Five Years
- D. Indefinitely

42. Documents and records required at temporary job-sites when performing a tracer study include:

- A. Operating and emergency procedures
- B. The latest survey instrument calibration records
- C. The latest survey records of transport and job-site
- D. Shipping papers
- E. Any reciprocity agreements
- F. All of the above
- G. None of the above

43. The Logging Supervisor can leave a temporary job-site once it is known that the pumping operation is proceeding safely.

True or False

44. Physical radiation surveys and monitoring at the temporary job-site (well location) are required as follows:

- A. Before the job is started
- B. During the job
- C. After the job
- D. All of the above
- E. None of the above

45. Physical inventory for accounting for the receipt, possession and use of licensed material must include:

- A. Quantity of isotope
- B. Identity of isotope
- C. Location of isotope
- D. Date of inventory
- E. Name of person doing inventory
- F. None of the above
- G. All of the above

46. The OK Tracers Material License permits the injection of licensed isotopes into fresh water aquifers.

True or False

47. Tell in your own words what "ALARA" means.

48. Which of the following protective clothing are required when transferring waste to a drum for storage?
- A. Apron or Coveralls
 - B. Gloves
 - C. Respirator
 - D. None of the above
 - E. All of the above
50. A survey meter must be capable of measuring 0.1 to 50 milliroentgens per hour.

True or False

51. Match the following:

- | | |
|-------------|---------------|
| A. Curie | A. Coulomb/kg |
| B. REM | B. Becquerel |
| C. Roentgen | C. Sievert |
| D. RAD | D. Gray |

52. Units of radioactivity are measured in terms of:

- A. Rad
- B. Rem
- C. Roentgen
- D. Curie

53. Licensed materials can be disposed of by incineration.

True or False

54. Any loss or theft of licensed material must be reported by telephone immediately and by written report within 30 days to U.S. NRC.

True or False

55. Form NRC-3, "Notice to Employees" must be posted in an obvious place along with a copy of the license, operating and emergency procedures, notices of violations, and licensees violation response:

True or False

Fifty of the above fifty-five questions must be completed correctly for qualification as a Logging Supervisor.

Signature of Trainee

Signature of RSO

Date:

RADIATION SAFETY QUIZ ANSWERS

- | | |
|--|---|
| 1. D. millicurie | 29. B. Rem |
| 2. B. Beta and Gamma | 30. A. blotting |
| 3. D. Gamma and Beta | 31. D. None of the above |
| 4. B. 8 days | 32. Background |
| 5. A. 75 days | 33. E. All of the above |
| 6. C. 84 days | 34. True |
| 7. D. All of the above | 35. True |
| 8. C. 5.3 feet | 36. False |
| 9. True | 37. C., B., A., D., E., G., F. |
| 10. B. 1.2 Rem | 38. C. Radioactive Yellow III |
| 11. A. Geiger counter | 39. 3 years |
| 12. True | 40. C. Semi-annually |
| 13. True | 41. D. Indefinitely |
| 14. A. Quarterly | 42. F. All of the above |
| 15. Time, Distance, & Shielding | 43. False |
| 16. C. 50 mCi | 44. D. All of the above |
| 17. A. Urine | 45. G. All of the above |
| 18. True | 46. False |
| 19. D. Semiannually &
after servicing | 47. Exposure & rad levels must be kept
as low as possible within economic
reason. |
| 20. Thorium & Uranium | 48. E. All of the above |
| 21. A. Six months | 49. Omitted |
| 22. Caution Radioactive Materials | 50. True |
| 23. Gloves | 51. A.-B., B.-C., C.-A., D.-D. |
| 24. False | 52. C. Roentgen |
| 25. A. 1 mR/hr | 53. False |
| 26. True | 54. True |
| 27. C. Cesium-137 | 55. True |
| 28. Contaminated | |

ATTACHMENT #3
FIELD PERSONNEL EVALUATION

1. Removal of tracer material from storage
 - a. Use of protective disposable gloves
 - b. Make appropriate entries on Storage Inventory
 - i. Quantity of isotope
 - ii. Identity of isotope
 - iii. Date
 - iv. Signature
 - c. Secure storage
2. Preparing shipment for transportation
 - a. Survey of transport vehicle before loading
 - b. Secure cargo
 - c. Apply placards
 - d. Perform transport vehicle surveys
 - i. Exterior surface readings
 - ii. Passenger area readings
 - iii. Make appropriate data entries
 - e. Make proper disposal of gloves after loading
3. Transport to well location
 - a. Prepare "Shipping Paper"
 - b. Security during transportation
 - c. Security during stops
 - d. Security at well site
4. Prejob radiation surveys
 - a. Job area
 - b. Well head
 - c. Waste pit
 - d. Personnel/clothing
 - e. Equipment
 - f. Make appropriate data entries
5. Setting up for Injection
 - a. Proper protective clothing
 - b. Connection of Injection device
 - c. Checking for leaks prior to adding isotope
 - d. Preparing isotope for injection
6. Injection
 - a. Communication with Service Company Supervisor
 - b. Check for leaks
 - c. Perform area surveys periodically
 - d. Record data
 - e. Isotope transfer and containment at end of job

7. Post job Radiation Surveys
 - a. Job area
 - b. well head
 - c. waste pit
 - d. Personnel/clothing
 - e. Equipment
 - f. Appropriate data entries
8. Transport for return to camp
 - a. Load and secure unused isotope if necessary
 - b. Load and secure injection equipment
 - c. Perform vehicle survey
 - d. Perform survey in passenger area
 - e. Connect or make new shipping papers
 - f. Contain disposable clothing
 - g. Make appropriate data entries
 - h. Security of isotope during trip
9. Return to Storage
 - a. Return unused isotope to storage
 - i. Use appropriate clothing
 - ii. Disposal of clothing
 - iii. Enter data on storage inventory sheet
 - b. Decontaminate injection equipment if necessary
 - i. Use appropriate clothing
 - ii. Disposal of dry wipes and clothing
 - iii. Secure against unauthorized removal
10. Complete "Radioactive Treatment Report".
11. Comments of Logging Supervisor or RSO:

Signature of Trainee

Date:

Signature of RSO

OK indicates all was well
X indicates advise necessary
I.P. indicates inadequate performance

The individual trainee must perform all functions with everything indicated OK by the RSO before permitted to perform tracer studies without supervision.

The same form will be used and completed by the RSO for annual performance evaluations of the "Logging Supervisors".

The individual undergoing annual evaluation must be advised that their performance is being evaluated and that incompetency will require dismissal.