

OSAGE WIRELINE, INC.

OPERATING AND EMERGENCY
PROCEDURES MANUAL

8902220580 880125
REG4 LIC30
35-18336-01 PNU

To: U.S. Nuclear Regulatory
Commission, Region IV

Material Licensing Division

OSAGE WIRELINE, INC.
OPERATING AND EMERGENCY
PROCEDURES MANUAL

Prepared by:

Keith E. Moon, Consultant
Support Consultants & Assoc., Inc.
Route 2, Box 254
De Leon, Texas 76444

(817) 893-2088

September 1987

461691

WHENEVER THIS MANUAL REFERENCES THE STATE OR FEDERAL
REGULATORY AGENCY, IT IS TO BE UNDERSTOOD THAT FOR
OPERATIONS IN THIS STATE THE AGENCY REFERENCED IS:

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV - OFFICE OF INSPECTION & ENFORCEMENT
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TEXAS 76012

TELEPHONE: (817) 860-8100

TABLE OF CONTENTS

OPERATING AND EMERGENCY PROCEDURES MANUAL

OPENING STATEMENT

- I. Management Responsibility
- II. Radiation Safety and Monitoring Devices
- III. Storage Facilities and Procedures
- IV. Source Handling Procedures
- V. Lost Source Procedures
- VI. Emergency Procedures
- VII. Source Maintenance & Disposal Procedures
- VIII. Transportation

REFERENCE FIGURES:

- Figure #1 - Source Inventory & Inspection
- Figure #2 - Source Utilization Log
- Figure #3 - Lost Source Procedures (A thru D)
- Figure #4 - Facility Drawing & Bunker Survey
- Figure #5 - Bunker Design
- Figure #6 - Job Site/Vehicle Survey

- APPENDIX A - ANNUAL INSPECTION CHECKLIST
- APPENDIX B - EXAMINATION

OSAGE WIRELINE INC.

OPERATING & EMERGENCY PROCEDURES MANUAL

OPENING STATEMENT:

This manual outlines procedures pertaining to the use and handling of radioactive sources. It is the intent of Osage Wireline, Inc. to comply in every way possible with State and Federal regulations for control of radiation. Although our operations are such that the levels of radiation provide a low risk of exposure, we will follow procedures and practices that will maintain doses to individuals as low as is reasonably achievable.

To insure compliance with regulations, a safety committee will be formed, consisting of:

Sherman Perrin, President
Michael Mackey, Radiation Safety Officer

The safety committee will regularly review the status of Osage Wireline, Inc.'s safety procedures and policies and search out any discrepancies which might exist. Our health physics program will be reviewed on a regular basis and upgraded as it pertains to exposure, and new programs implemented if determined that improvement can be made.

It is the intent of Osage Wireline, Inc. to minimize safety and non-compliance problems, to minimize hazards to employees, and to ensure that all company personnel are committed to a safe and proficient safety program. We will make every effort to inform and train our employees in the proper use and handling of radioactive materials. We will provide appropriate handling tools, survey equipment, and personnel monitoring devices for the protection of our employees. We will promote use of time, distance and shielding to minimize exposure and will follow to the best of our ability procedures to assure that no radiation exposure will cause harm to our personnel, our customer's personnel, or the general public.

The following pages outline our operating procedures and emergency procedures, which we submit to replace those previously submitted.

I. MANAGEMENT RESPONSIBILITY

A. The Radiation Safety Officer (RSO) is responsible for the over-all coordination of the radiation safety program, serves as the licensee's liaison officer with the NRC on license or inspection matters, and acts in an advisory capacity to the licensee's management and logging personnel. Typical duties of the RSO include:

1. Develop and maintain up-to-date operating and emergency procedures.
2. Control procurement and disposal of licensed material, maintain associated records, and ensure that licensed materials that are possessed or used are limited to those specified in the license.
3. Ensure that the terms and conditions of the license are met and that required records, such as personnel exposure records, leak test records, etc., are periodically reviewed for compliance with NRC regulations and license conditions.
4. Conduct radiation safety inspections of licensed activities periodically to ensure compliance with the regulations and license conditions.
5. Establish and maintain storage facilities and ensure that licensed material is properly secured against unauthorized removal at all times.
6. Ensure that the licensed materials are used only by those individuals who have satisfactorily completed appropriate training programs or who are authorized by the license.
7. Examine and determine the competence of logging personnel, and establish and maintain the annual internal inspection program.
8. Establish and conduct in-house training of prospective logging supervisors and logging assistants.
9. Establish and maintain a personnel monitoring program and ensure that all users wear personnel monitoring equipment, such as film badges or thermoluminescent dosimeters (TLD).
10. Establish and maintain the leak test program and supervise leak testing of sealed sources.
11. Procure and maintain radiation survey instruments and establish and maintain a survey instrument calibration program.
12. Conduct semiannual inventories and maintain utilization logs.
13. Review and ensure maintenance of records kept by others.
14. Establish and maintain proper transportation labels, placards, forms and records.
15. Establish a procedure for evaluating and reporting equipment defects and noncompliance pursuant to 10 CFR Part 21.
16. Serve as a point of contact and give assistance in case of emergency, for example, well logging tool damage, theft of licensed materials, fire, etc., and ensure that proper authorities, for example, NRC, local police, and State personnel are notified promptly in case of accident or other incident that may involve the release of licensed material.
17. Investigate the cause of incidents and determine necessary preventative action.

B. Master Radiation Files will be maintained at the base facility by the Radiation Safety Officer. Typical records contained in these files are:

1. Radiation License Information

- (a) License and Amendments
(retain until license renewed or terminated)
- (b) Operating & Emergency Procedures Manual
(retain until replaced or license terminated)
- (c) State/Federal Regulations -- update and keep current
(retain until replaced or license terminated)

2. Personnel Exposure Records

- (a) Exposure reports from dosimetry service
(retain until NRC authorizes disposition)
- (b) Employee termination exposure report letters
(retain for 3 years after termination of employment)

3. Training Records

- (a) Certificates, tests and other documentation verifying training set out in 10 CFR 39.61.
(retain for 3 years after termination of employment)
- (b) Records of annual inspection of job performance of logging supervisors. (retain 3 years)
- (c) Records of annual safety reviews for logging supervisors and assistants. (retain 3 years)
- (d) Records of instruction provided to ancillary personnel at time of initial employment and annually thereafter.
(retain 3 years)

3. Survey Records

- (a) Survey meter calibration certificates (retain 3 years)
- (b) Bunker/Facility surveys (retain 3 years)
- (c) Job site/Vehicle surveys (retain 3 years)

4. Source Information

- (a) Receipts of purchase and disposal
(retain until license is terminated)
- (b) Leak/wipe test reports (retain 3 years)
- (c) Source utilization log (retain 3 years)
- (d) Semi-annual physical inventory (retain 3 years)
- (e) Semi-annual visual inspection and routine maintenance of source holders, handling tools, storage/transport containers and logging tools. (retain records of defects for 3 years)

C. Bulletin Board

1. Post - "Notice to Employees"
2. Post - Current personnel exposure report (photocopy)
3. Post - Notice of where license, procedures manual, and regulations can be found.

D. Documents and records at temporary job sites:

1. Operating and emergency procedures.
2. Survey records for the period of operation at the temporary job site.
3. Evidence of current calibration for the radiation survey instruments in use at the temporary job sites.
4. A copy of radioactive material license, if operating under reciprocity.
5. Shipping papers.

E. Documents and records at field stations where radioactive materials are used or stored:

1. Copy of radioactive material license.
2. Operating and emergency procedures.
3. Applicable NRC and/or Agreement State regulations.
4. Records of latest survey instrument calibrations on each survey instrument assigned to field station.
5. Records of latest leak test results on each sealed source assigned to field station.
6. Semiannual physical inventories of radioactive materials stored at field station.
7. Utilization records. (for field station)
8. Records of equipment inspection and maintenance. (for field station)
9. Facility, bunker, vehicle, job site, etc. surveys. (for field station)
10. Training records for each logging supervisor and logging assistant assigned to and/or operating out of field station.

F. Training of Personnel

1. At the time of initial employment, any ancillary personnel whose duties may require them to work in/around or visit a restricted area (for example, secretarial and janitorial personnel or assistants other than logging assistants, such as riggers) will be instructed in the radiation hazards and appropriate precautions as prescribed in 10 CFR 19.12 "Instructions to Workers".
 - a. Instruction will be given by the Radiation Safety Officer and will be approximately 1-2 hours in length.
 - b. Topics to be included in the instruction are:
 - (1) Storage, transfer, and use of licensed materials at our facility and temporary work sites.
 - (2) Basic principles and fundamentals of radiation safety and good safety practices related to our use of radioactive materials.
 - (3) Precautions and procedures to minimize exposure to radiation and radioactive materials.
 - (4) Purpose and function of radiation protection devices.
 - (5) Applicable provisions of NRC regulations for protection of personnel from radiation exposure.
 - (6) Worker's responsibility to report to the licensee any condition which may lead to or cause a violation of NRC regulations, license conditions, or unnecessary exposure to or release of radioactive materials.
 - (7) Appropriate response in the event of any unusual occurrence or malfunction which may lead to radiation exposure or release of radioactive materials to the environment.
 - c. A review of these topics will be made annually either individually or in group sessions.
 - d. Records documenting this instruction for each individual will be maintained for 3 years.

2. No company employee will be permitted to act as a logging supervisor (use or supervise the use of licensed material) until he has:
 - (a) Completed a radiation safety training course covering subjects outlined in 10 CFR 39.61 (e), demonstrated by passing a written test. This course will be taught by a instructor approved by the NRC to give radiation safety training specific for well loggers. (24 hours classroom)
 - (b) Received copies of, instruction in and demonstrated an understanding of: NRC regulations contained in the applicable sections of 10 CFR Parts 19, 20, and 39; our NRC license; and our Operating and Emergency Procedures manual. (8 hours classroom)
 - (c) Completed three months* on-the-job training and demonstrated competence in the use of licensed materials, remote handling tools, and radiation survey instruments by a field evaluation. (* 520 hours for sealed source use; 50 operations for each type of tracer operation performed, if licensed for tracers.)
3. No company employee will be permitted to act as a logging assistant (handle licensed material and perform surveys under personal supervision of a logging supervisor) until he has:
 - (a) Received instruction in applicable sections of 10 CFR Parts 19 and 20, and our operating and emergency procedures. (2-4 hours classroom instruction)
 - (b) Received instruction in the use of licensed materials, remote handling tools, and radiation survey instruments, appropriate for the logging assistant's job responsibilities. (1-2 hours on-the-job instruction)
 - (c) Demonstrated understanding of the above by completing a 25 question written or oral test.
4. An individual who has been a logging supervisor for another licensee will not be permitted to act as a logging supervisor for our company until he has:
 - (a) Received formal instruction in topics outlined in 10 CFR 39.61(e).
 - (b) Received instruction in our Operating & Emergency Procedures.
 - (c) Received instruction in NRC regulations (applicable sections of Parts 19, 20, & 39).
 - (d) Received instruction in terms and conditions of our license.
 - (e) Received instruction in use of licensed materials, remote handling tools and radiation survey instruments.
 - (f) Successfully completed a 50 question written exam and a field (practical) examination. (See APPENDIX B for exam. Field (practical) examination will consist of observing procedures in Section IV and items in APPENDIX A.)

5. "In-house" instruction and testing will be conducted by the Radiation Safety Officer. Records of qualifications, certificates of training, tests, field evaluations, etc. indicating that the training requirements have been met will be maintained in the radiation files for inspection and retained for at least three years following termination of the individual's employment.
6. The Radiation Safety Officer will conduct an annual inspection (audit) of job performance of each logging supervisor as prescribed in 10 CFR 39.13(d) to ensure that NRC regulations, license provisions, and our operating and emergency procedures are being followed:
 - (a) Annual inspections will be conducted on each logging supervisor at intervals not to exceed one year. Should a logging supervisor not perform well logging operations for a period that exceeds one year, the inspection should be carried out the first time that individual engages in well logging operations.
 - (b) Annual inspections will be made at a job site and, insofar as possible, unannounced.
 - (c) Annual inspection will be recorded on Annual Inspection Checklist (Appendix A) and this record for each individual will be retained for 3 years.
 - (d) Any deficiencies identified will be discussed with the logging supervisor, instruction for correction of deficiencies will be given, and logging supervisor will be informed of actions that will be taken by management if the deficiencies are not corrected. A followup audit will be made to ensure that deficiencies have been corrected.
7. Safety reviews will be provided for logging supervisors and logging assistants at least once during each calendar year, as prescribed in 10 CFR 39.61.
 - a. Topics reviewed will be: radiation safety principles, current regulations, new regulations or requirements, operating and emergency procedures, company policy with respect to radiation safety practices and any problems or deficiencies identified from our annual inspection program.
 - b. Safety reviews will be conducted individually or in group sessions and instruction will be by the Radiation Safety Officer or Keith E. Moon of Support Consultants & Assoc.
 - c. Records of annual safety reviews will include topics discussed and will be retained for 3 years.

II. RADIATION SAFETY AND MONITORING DEVICES

A. TLD Badges (Thermoluminescent Dosimeter)

1. A TLD badge will be assigned by name and number to each employee working with radioactive materials. Under NO circumstances will an employee be permitted to use a TLD badge other than his own.
2. The RSO will be responsible for the distribution of the TLD badges and the procedures governing their use. Care should be taken to prevent exposure of TLD badges to environmental conditions which involve excessive heat or moisture as such exposure will impair the ability of the badges to measure radiation dosage.
3. TLD badges will be worn attached to clothing in the trunk area of the body during all operations which involve possible exposure to radiation.
4. TLD badges will be returned to the RSO, or his designated representative, at the end of the control period for the badge.
5. TLD badge reports will be kept current by the RSO and he will review them upon receipt noting any unusual or excessive amounts of exposure. These reports will become a part of each employee's personnel record by means of a quarterly individual exposure report. Each person to whom a TLD badge is assigned will be informed of his total radiation exposure upon request or within thirty (30) days after termination.

B. Survey Meters

1. A radiation survey meter shall be carried on each vehicle used for transportation of radioactive materials. Survey meters shall be sensitive to beta and gamma radiation and have a range of at least 0-50 mr/hr.
2. One or more operable radiation survey meter will be kept at the base facility as a spare and for emergency use.
3. A job site survey must be made before and after each operation using radioactive materials. A record of each survey will be kept in the radiation files.
4. A calibration check shall be performed on each radiation survey meter in service at six months intervals and after repair. The calibration check shall consist of testing the survey meter at two points other than zero, on each scale using a radiation source of known output. The calibration will be performed by a State or Federal approved survey meter calibration service company. Certificates of calibration will be kept in the radiation files.

C. Leak/wipe Tests for Sealed Sources

1. A leak/wipe test shall be performed on each sealed radiation source at six months intervals. Leak/wipe tests will be performed by the RSO or other authorized radiation handler.
2. Leak/wipe tests will be performed through the use of kits according to the accompanying instructions. The kits will be supplied by one of the following:
 - Suntrac Services, Inc., Webster, TX (SIT-1)
 - G.E. Smith & Associates, Pasadena, TX (Leak Test Kit #2)
 - Nuclear Sources & Services, Inc., Houston, TX (LT-1)
 - Gulf Nuclear, Inc., Houston, TX (LTK-1)
 - Eberline Instruments, Santa Fe, NM
3. After the leak/wipe test is performed, the kit will be checked with a survey meter prior to any shipment by U.S. mail or private carrier.
4. Leak/wipe test evaluations will be done in accordance with standard license requirements, and will provide data sensitive to 0.005 microcurie of removable contamination.
5. Results of leak/wipe tests (evaluation reports) will be retained the radiation files for 3 years.

III. STORAGE FACILITIES

A. Storing and Securing

1. When not being used, the radioactive source(s) will be placed in a secure area that is properly marked with warning signs around the perimeter. This storage area will be locked at all times except when removing or returning sources.
2. Storage facilities are designed and positioned so that no person in an uncontrolled area will receive more than 2 mR in any hour, or more than 100 mR in any seven (7) consecutive days.
3. Only persons authorized by the license (either named on the license or designated by the RSO) will be allowed to remove or replace the source(s).
4. Surveys of the storage area will be made monthly and whenever the number of sources is increased. Surveys will be made by the RSO and kept in the radiation files for three years.

B. Posting Storage Areas and other Restricted Areas

1. Storage areas and restricted areas where radiation levels are expected to achieve 2 mr/hr will be posted with signs stating "Caution - Radiation Area" or "Caution - Radioactive Materials." In the event that radiation levels exceed 5 mr/hr, then a sign stating "Caution - High Radiation Area", must be posted.
2. Signs will bear the standard radiation caution symbol and be magenta and safety yellow in color. They will be conspicuous and obvious from all directions.

C. Vehicle Storage

1. The radioactive source will be locked in an approved DOT 7A transport container which will be locked at all times except when removing or replacing the source.
2. The transport container will be placed in a designated area near the rear of the transport vehicle at the furthest point possible away from the driver or passengers, and fastened or chained to an integral part of the vehicle.
3. The vehicle may be used for temporary storage at a job site, also at the field station for a day or two when job intervals are frequent, to avoid unnecessary exposure when removing it to and from the storage bunker.
4. When the vehicle is being used as a storage facility, the "RADIOACTIVE" placard will be removed and "Caution - Radioactive Materials" signs substituted.
5. Vehicle must be kept locked when it is being used for storage and is unattended. It should also be within the confines of a locked fence or building, if possible.

IV. SOURCE HANDLING PROCEDURES

- A. At no time will a source holder be handled by hand. Loading and unloading will be done with the aid of an approved source handling tool.
- B. All employees involved in operations using a source will wear a personnel monitoring device (TLD badge). A certified calibrated low level survey meter (beta/gamma) will be available during all operations using a source.
- C. Prior to each use, logging supervisor will visually check source holders, logging tools, and source handling tools for defects to ensure that equipment is in good working condition and required labeling is present.
 - 1. Notation that inspection was made is recorded on the Source Utilization Log (Ref: Figure #2)
 - 2. If defects are found, the equipment must be removed from service until repaired and a record made of the following: (a) date of check; (b) name of inspector (logging supervisor); (c) equipment involved; (d) defects found; and (e) repairs made.
 - 3. Radiation Safety Officer must be notified of equipment malfunctions or defects and report certain defects to the NRC in accordance with 10 CFR Part 21.
- D. Remove source holder from the storage bunker using source handling tool. After visual check, source is placed into transport container and a survey made at approximately six inches from the exterior of the container. Survey is recorded on Source Utilization Log and other items on log completed prior to leaving facility.
- E. At the well location, and prior to beginning operations utilizing the source, operator will complete "before" portion of Job Site Survey.
- F. A restricted area of not less than 30 feet around the work area will be established and marked with signs, barrier rope, or other designation. Direct surveillance will be maintained by the logging supervisor or designated employee during all source handling procedures to protect against unauthorized and/or unnecessary entry into the restricted area.
- G. Using the remote handling tool, the source holder is removed from the transport container. The source holder is attached to the logging tool and lowered into the well.
- H. When well logging procedures have been completed, the logging tool is returned to the surface, the source holder is removed and placed back into the transport container. A vehicle survey is taken to check for contamination and proper transport index, and "after" portion of Job Site Survey completed to ensure there is no ground contamination.
- I. Upon return to facility, source transport container is surveyed and logged on the Source Utilization Log as in Item D above. Source holder will then be returned to the storage bunker using the source handling tool. If storage bunker is designed to hold the transport container, source holder need not be removed or replaced from the transport container other than at job site location.

V. LOST SOURCE PROCEDURES (Ref: Figure #3)

A. Prior to performing well logging operations using a sealed source, a written agreement* (Ref. 10 CFR Part 39.15) must be executed between licensee and the well owner/operator, stating that:

1. Should a well logging source be lodged in a hole:
 - a. A reasonable effort will be made to recover the source.
 - b. No attempt will be made to recover a lodged source in a manner which, in the licensee's opinion, could result in its rupture.
 - c. Licensee will continually monitor, with an appropriate radiation detection instrument or a logging tool with a radiation detector, the circulating fluids from the well, if any, to check for possible contamination resulting from damage to the source.
 - d. Should the environment, any equipment, or personnel become contaminated with licensed material, they must be decontaminated before release from the site to an unrestricted area.
2. Within thirty (30) days after a well logging source has been classified as irretrievable:
 - a. The source will be immobilized and sealed in place with a cement plug.
 - b. A whipstock or other mechanical device will be set well above the cement plug unless the source is not accessible to any subsequent drilling operations.
 - c. A permanent identification plaque will be mounted at the surface of the well.

(The actions outlined in Items 1 & 2 above are to be carried out through a joint effort between the licensee and the well owner/operator, however, the licensee takes primary responsibility for actions in Item 1 and the well owner/operator takes primary responsibility for actions in Item 2.)

* If the well owner or operator are part of the same corporate structure or otherwise affiliated, a written agreement is not required.

B. In the event a well logging tool containing a sealed source of radioactive material is stuck/lodged in an oil or gas well, the following procedures should be followed to insure maximum safety:

1. Well logging supervisor will remain in contact with the well operator to ensure that a reasonable effort is made to recover the source, offer advice and recommendations regarding safe fishing (retrieval) procedures making sure that well operator is aware of the possibility that fishing procedures might damage the source, and ensure that no retrieval attempt is made in a manner that might result in rupture of the source.
2. During the retrieval operations, the logging supervisor will continually monitor for radiation at the surface, using a gamma logging tool near the pipe for fluids circulating from the hole, or using a low level beta/gamma survey meter with a thin window beta probe, or a scintillation probe with high enough energy resolution to accommodate the pipe thickness.
3. Upon retrieval of the source, if no radioactive contamination is detected, logging supervisor will remove the source assembly from the logging tool (using source handling tool) and physically check it for any damage such as abrasions brought about by metal to metal contact or any disfigurement brought about by pressure.
4. Should any radioactive contamination be detected during retrieval or if the source appears to be damaged, logging supervisor will immediately notify our Radiation Safety Officer who will immediately thereafter notify the State or Federal regulatory agency governing radiation. (Emergency telephone number on cover page of this manual.) Should there be any radioactive contamination of the environment, equipment or personnel, they must be decontaminated before release from the site to an unrestricted area.
5. If there is no evidence of radioactive contamination or physical damage, the source will be returned to a licensed storage facility for our company where it will be leak/wipe tested and the wipe sent for immediate analysis. The source will be kept in the storage container out of service pending receipt of the analysis results.

C. If it becomes apparent that the source cannot be retrieved and will have to be abandoned downhole, our Radiation Safety Officer will notify the State or Federal regulatory agency having jurisdiction over radiation and any regulatory agency governing the drilling of oil and gas wells. Following are procedures for safe abandonment of a source downhole:

1. After notifying the regulatory agencies, the Radiation Safety Officer should determine steps to be taken to abandon the source in such a way as to protect persons and property now and in the future, considering what the well operator wishes and can reasonably do, and then present this proposal to the regulatory agencies for final approval or further recommendations.

2. A source left below a producing zone presents little difficulty. In most cases the normal cementing of the production string of casing or tubing will isolate the source. If the well is to be produced from open hole completion, cement should be spotted around and/or above it to prevent the movement of fluids past the capsule and eventual destruction of the capsule through abrasion.
3. In questionable cases the life of the capsule and the solubility of radioactive material might influence the acceptance of the proposal. (The source capsules have an estimated life of 500 years in undisturbed salt water. The solubility of the radioactive materials is in the order of one part per billion per week.)
4. Production of gas, water or oil past a source should be prohibited unless the capsule is protected from abrasion. Casing or tubing should be adequate. The spotting of cement, if practical and feasible, adds to the protection. Care should be taken in setting casing past the location of the tool to avoid dislodging it. A gamma-ray survey run after the casing is below the zone will give assurance that the tool and source will not be encountered and damaged at a lower level.
5. In the event a source is left in a producing zone, it should be cemented in place if possible. Extreme caution should be used to avoid re-entering the original hole and damaging the source container. Normally, the source is at or near the bottom of the tool. If there were sufficient clearance to place cement around the source, the tool would, in most cases, be retrievable. However, the drilling mud would probably harden in a short time to prevent appreciable flow of fluids by the source. In addition, the separation between the new and old holes would reduce the rate of flow at the tool to a very small figure. It is recommended that the new and old holes be separated by at least 15 feet to preclude any possibility of damage to the source by perforating.
6. Upon abandonment of a radioactive source in an oil or gas well, licensee shall provide a permanent plaque for posting the well or well bore. It shall be constructed of long-lasting material such as stainless steel, brass, bronze, or monel and contain the following information engraved on its face:
 - a. The word "CAUTION" in large letters.
 - b. The radiation symbol (color not required).
 - c. The date of abandonment.
 - d. The name of the well operator or well owner.
 - e. The well name and well identification number(s) or other designation.
 - f. The sealed source(s) by radionuclide and quantity of activity.
 - g. The source depth and the plug back depth (depth to the top of the plug).

- h. An appropriate warning, depending on the specific circumstances of each abandonment, such as (1) "DO NOT DRILL BELOW PLUG BACK DEPTH", (2) "DO NOT ENLARGE CASING", (3) "DO NOT RE-ENTER HOLE", followed by --- BEFORE CONTACTING (whichever is appropriate) THE U.S. NUCLEAR REGULATORY COMMISSION //or// THE STATE BUREAU OF RADIATION CONTROL.
- 7. A written report must be filed with the Regional Office of the NRC or the Agreement State Bureau of Radiation Control within 30 days of abandonment, giving description of attempts to recover the source and results of retrieval attempts; steps taken to isolate and protect the source; all pertinent well information; and information contained on the permanent identification plaque. A copy of this report should also be furnished to the State agency issuing permits for or controlling the drilling of oil and gas wells.

VI. EMERGENCY PROCEDURES

A. Vehicle Wreck - In the event of an accident while transporting radioactive materials, the following procedures should be followed:

1. Do not leave the area unattended by qualified personnel.
2. Notify the investigating officer.
3. Notify the Radiation Safety Officer.
4. Survey the area and close off any area where the radiation level exceeds 2 mr/hr.
5. Decontaminate the contaminated area (if any).
6. The RSO will notify the proper regulatory agency.

B. Fire and Other Emergencies

1. Notify all personnel in the area immediately.
2. Attempt to put out all fires if a radiation hazard is not immediately present.
3. Notify the fire department.
4. Notify the Radiation Safety Officer.
5. The RSO will set up restrictions governing the fire fighting and other emergency activities.
6. Following the emergency, monitor the area and ascertain the emergency devices necessary for safe decontamination.
7. Decontaminate.
8. The RSO will have to approve the area before work can resume.
9. Monitor all persons involved in combating the emergency.
10. Prepare a complete history of the accident and report to the Radiation Safety Officer who will in turn report to the State or Federal agency governing radiation.

C. Leaking Source

1. If there is indication that a source is leaking, immediately call RSO for instructions.
2. If at a job site location, shut operation down, set up a control area around the source to keep personnel out, and notify well operator.
3. If RSO determines that source may be leaking, transport container (with source inside) will be isolated in a restricted area and kept in storage and out of service pending leak/wipe test analysis.
4. RSO will direct procedures for leak/wipe test and monitoring of location/facility and personnel.
5. RSO will notify State or Federal agency governing radiation immediately upon determining that source is leaking.

D. Lost Source Downhole (See Section V - Lost Source Procedures).

E. Theft or Loss of Source

1. Licensee (RSO) shall report immediately by telephone and confirm promptly by letter to the State or Federal authorities the theft of a source as soon as such theft or loss becomes known to licensee.
2. Every investigative method should be taken to recover source.

F. Notifications of Incidents

1. Regulations call for immediate notification for certain incidents and twenty-four hour notification for others, which involve excessive exposure, release of radioactive material (source rupture), and damage to property.
2. These regulations also require followup reports.

G. Reports of Overexposures

1. Regulations call for reports in writing within 30 days of an incident where an individual has an exposure in excess of the applicable limits, where levels of radiation or concentrations of radioactive material in a restricted area are in excess of applicable limits set out in the license, and other cases outlined in the regulations.
2. Reports must contain identification of individuals, identification and levels of radioactive materials involved, cause and corrective steps to assure against recurrence.

ANY EMERGENCY SITUATION MUST BE IMMEDIATELY REPORTED TO THE RADIATION SAFETY OFFICER FOR OUR COMPANY:

Radiation Safety Officer: _____

Telephone Number: _____

EMERGENCY TELEPHONE NUMBER FOR REGULATORY AGENCY IS IN FRONT OF THIS MANUAL.

VII. SOURCE MAINTENANCE AND DISPOSAL PROCEDURES

- A. Every radioactive source must be accounted for. Licensee must have records of receipt and disposal and maintain a current source inventory. A source cannot be sold or transferred to anyone who does not have in his possession a current radioactive material license authorizing possession of that particular source (manufacturer, model, and curie quantity).
- B. A semi-annual visual inspection and routine maintenance of source holders, logging tools, source handling tools, storage containers, and transport containers will be conducted by the Radiation Safety Officer at the time of the leak/wipe tests, to ensure that no physical damage is visible and that labeling is legible. If defects are found, the equipment will be removed from service and a record made listing (a) defects found, (b) maintenance operations performed, (c) actions taken to correct defects.
- C. Each source, source holder, or logging tool containing radioactive material shall bear a durable, legible and clearly visible marking or label, which has, as a minimum, the standard radiation caution symbol, without the conventional color requirement, and the following wording:

DANGER (OR CAUTION)
RADIOACTIVE

This labeling shall be on the smallest component transported as a separate piece of equipment.

- D. Each transport container should have permanently attached to it a durable, legible, and clearly visible label which has, as a minimum, the standard radiation caution symbol and the following wording:

DANGER (OR CAUTION)
RADIOACTIVE
NOTIFY CIVIL AUTHORITIES (OR COMPANY NAME)

- E. Under NO circumstances will any employee of licensee remove a source from a source holder or assembly. It is prohibited to make effort to remove sources stuck in a handling tool, logging tool, etc., which involve chiseling, drilling, cutting, etc.
- F. Any maintenance or service operations which require direct hand contact with the source assembly, such as cleaning or "O" ring exchange will be performed as follows:
1. Since the source assembly is threaded, a hand tool with the appropriate thread, no less than 24" in length, will be made and screwed into the source assembly. The hand tool then will be secured in a table mounted vice. Note: If there is thread damage, the source will be sent back to the manufacturer for repair or replacement.
 2. The "O" rings will be cut off with a razor knife. The source assembly will be cleaned with a long nosed solvent spray apparatus, which can be purchased at any automotive supply.

3. Upon completion of the cleaning, a piece of PVC pipe, 18" in length and of the appropriate diameter to fit over the source assembly, will be used to transfer greased "O" rings to the two grooves that have been cleaned. The PVC pipe will be placed over the source assembly with only the "O" ring groove exposed. A modified round wood stick with a flat end will push the "O" ring off of the PVC pipe into the "O" ring groove. Repeat procedures for second "O" ring.
 4. Upon completion of replacement of the "O" rings, the handling tool used for normal operations will be used to unscrew the source assembly from the support holding tool while still in the vice and replaced to its assigned transportation container/shield.
- G. Sealed sources will be returned to the manufacturer for disposal, in compliance with transportation regulations previously mentioned in this manual. Receipt from manufacturer must be placed in the radiation files as a record of disposal.

VIII. TRANSPORTATION

- A. Sources will be transported in accordance with applicable Department of Transportation (DOT) regulations (49 CFR Part 172).
- B. Documentation must be on file for each source transported by the licensee as follows: (49 CFR Part 173)
 - 1. Safety analysis containing the results of performance tests demonstrating that the source meets the "special form" requirements.
 - 2. Written results of the Specification 7A package tests performed on the transport container.
- C. Sources must be packaged, labeled, marked and accompanied with appropriate shipping papers in accordance with NRC regulations (10 CFR Part 71).
 - 1. Packaging: Must be contained in Specification DOT 7A transport/storage container.
 - 2. Labeling: Label categories for well logging sources are Yellow II and Yellow III (White I not applicable). The proper label to affix to the source transport container is based on the transport index (TI), which is the maximum radiation level in millirem per hour at one meter from the external surface of the container.
 - a. TI less than 1.0 -- Yellow II
 - b. TI more than 1.0 and less than 10.0 -- Yellow III
 - c. Labels are 4" x 4", yellow top half and white lower half.
 - 3. Markings: Transportation container must be marked with letters at least 1/2 inches high, "USA DOT TYPE A". Additional markings are outlined in Section VII, Items C & D of this manual.
 - 4. Shipping Papers: Must contain information set out in Subpart C of 49 CFR Part 172; must be properly completed and signed; must be located in the cab of the transport vehicle within reach of the driver.

D. During transportation to and from location and for temporary storage on the vehicle:

1. Each source must be in its approved DOT 7A transport/storage container.
2. Container must be locked and physically secured to prevent tampering or unauthorized removal of source.
3. Transport container should be positioned in a designated area of the vehicle located at the furthest point possible away from driver or passengers.
4. Transport container must be locked in a storage compartment or fastened to an integral part of the transport vehicle to prevent accidental loss, tampering, or unauthorized removal.

E. Surveying:

1. Prior to transporting, exterior surfaces and passenger compartment of the vehicle must be surveyed to ensure that the radiation levels do not exceed 2 mR/h at any exterior surface and 2 mR/h in the passenger compartment.
2. If the radiation levels exceed 2 mR/h in the passenger compartment, the source should be repositioned within the vehicle or more shielding added.

F. Placarding:

1. Vehicles transporting sources which require a Radioactive Yellow III label must be placarded on both sides, the front, and the back with "RADIOACTIVE" placards.
2. Placard is approximately 11" x 11" and diamond shaped, with a yellow (top half) and white (bottom half) and black lettering.
3. "RADIOACTIVE" placard must not be displayed when sources are not on vehicle.
4. If vehicle is being used for temporary storage at a job site or the field station, the "RADIOACTIVE" placard will be removed and "Caution - Radioactive Material" signs substituted. Radiation level may not exceed 2 mR/h at any external surface of the vehicle. Vehicle must be locked when it is used for storage.

Figure #1

BY _____

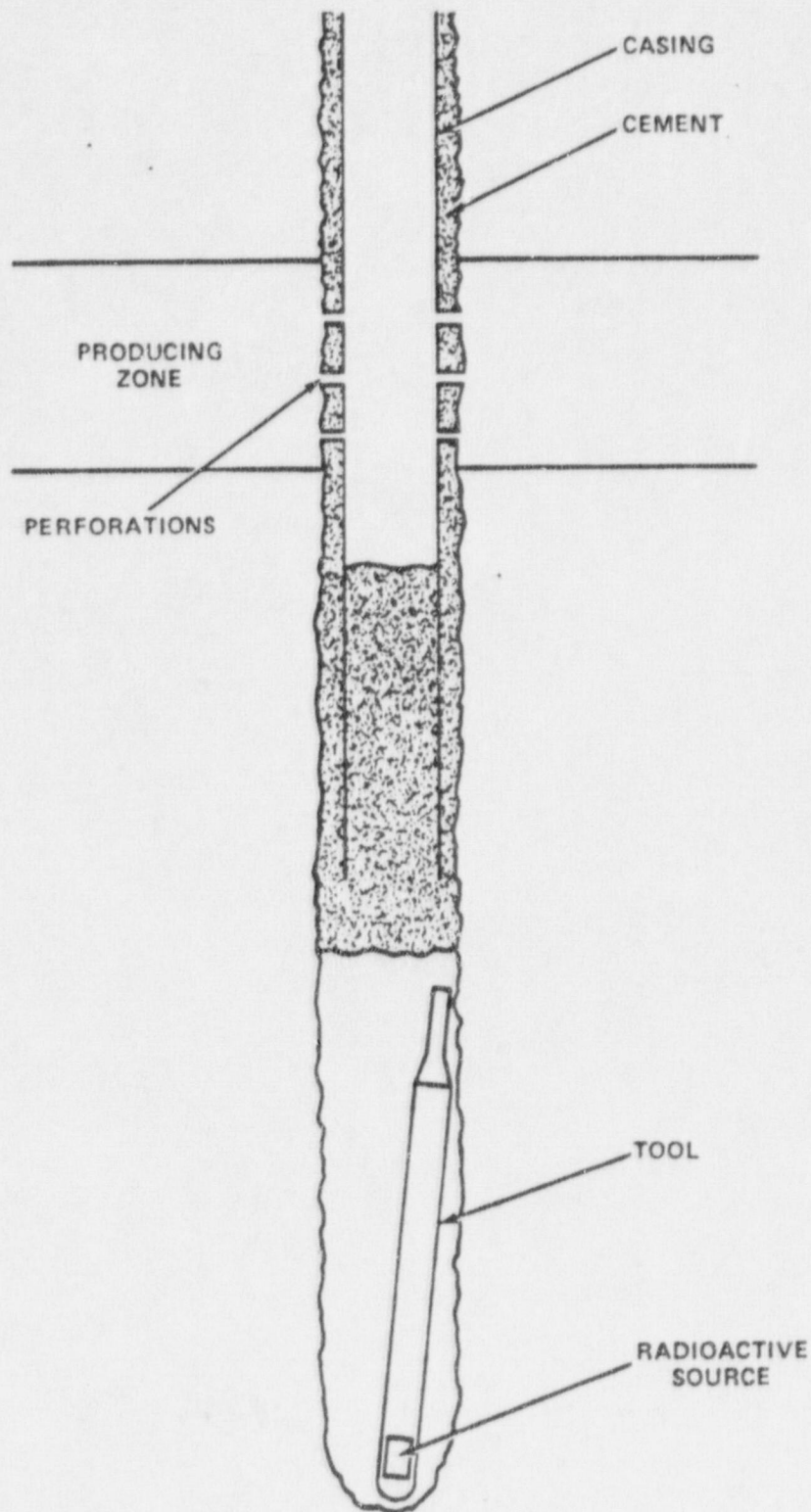
DATE _____

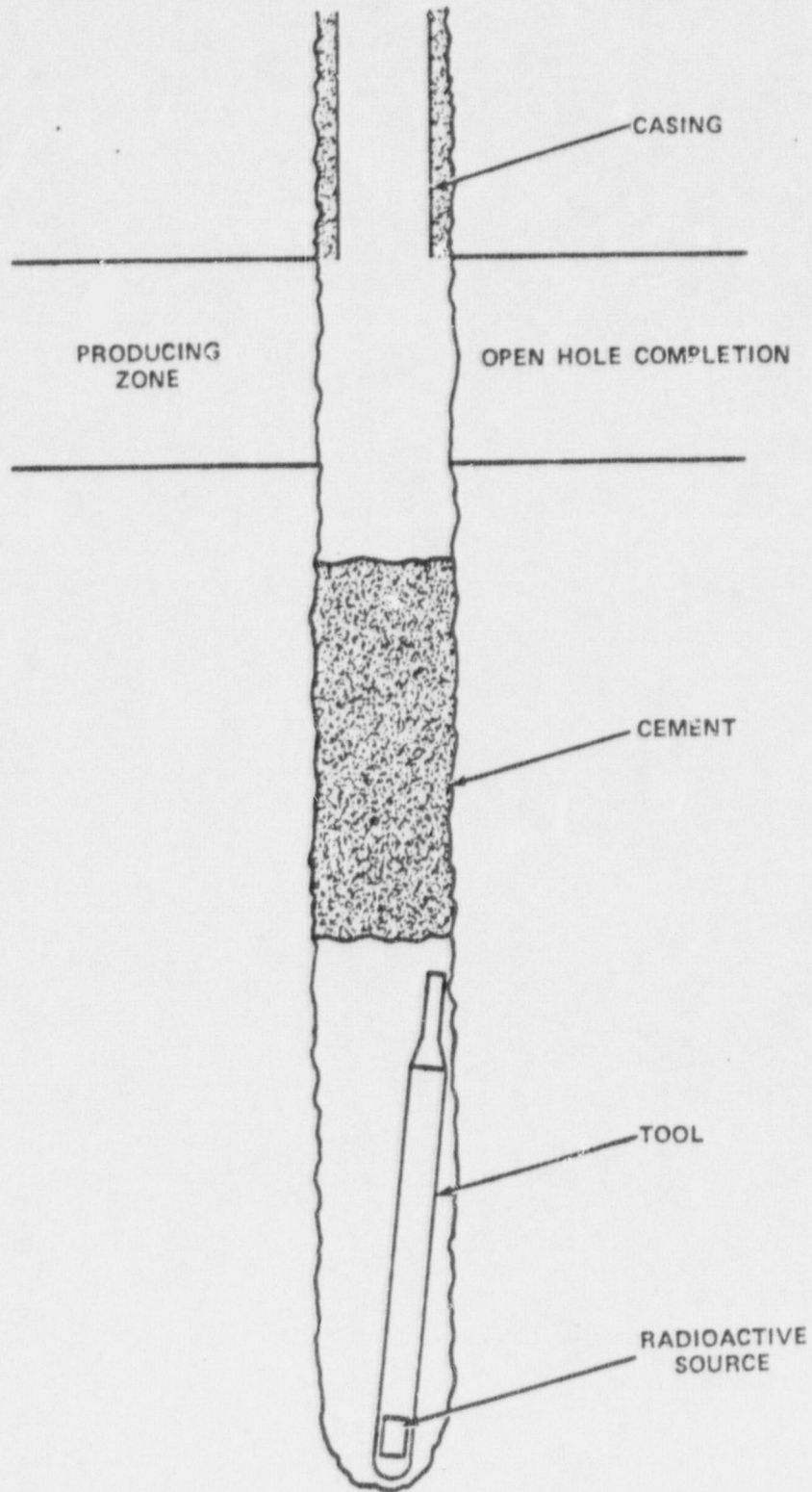
Note: Physical inventory and inspection must be conducted every six months and kept on file for 3 years. Can be done at the same time as the leak tests.
Ref. 10 CFR Parts 39.35(c); 39.37; 39.43(b)

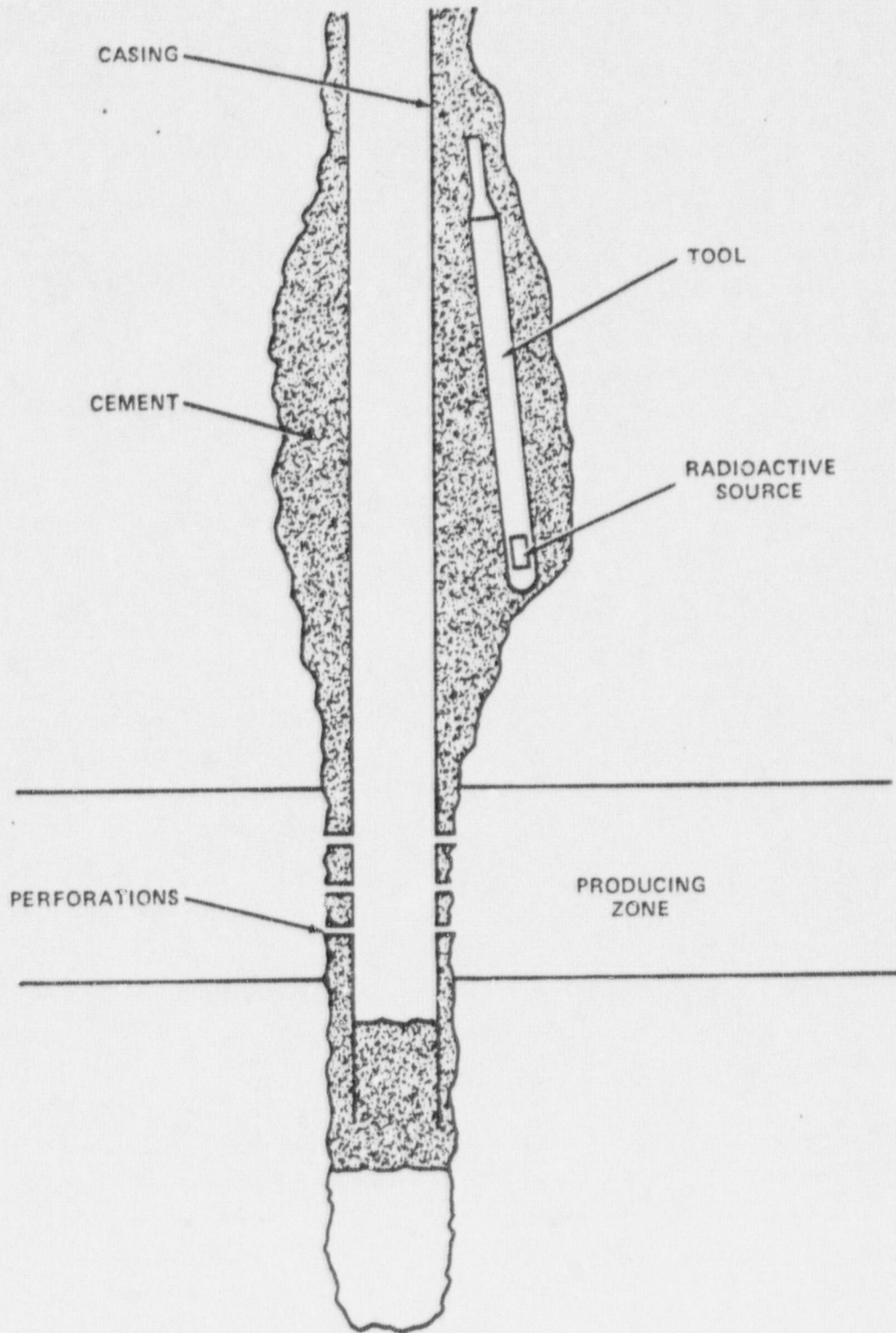
SOURCE UTILIZATION LOG

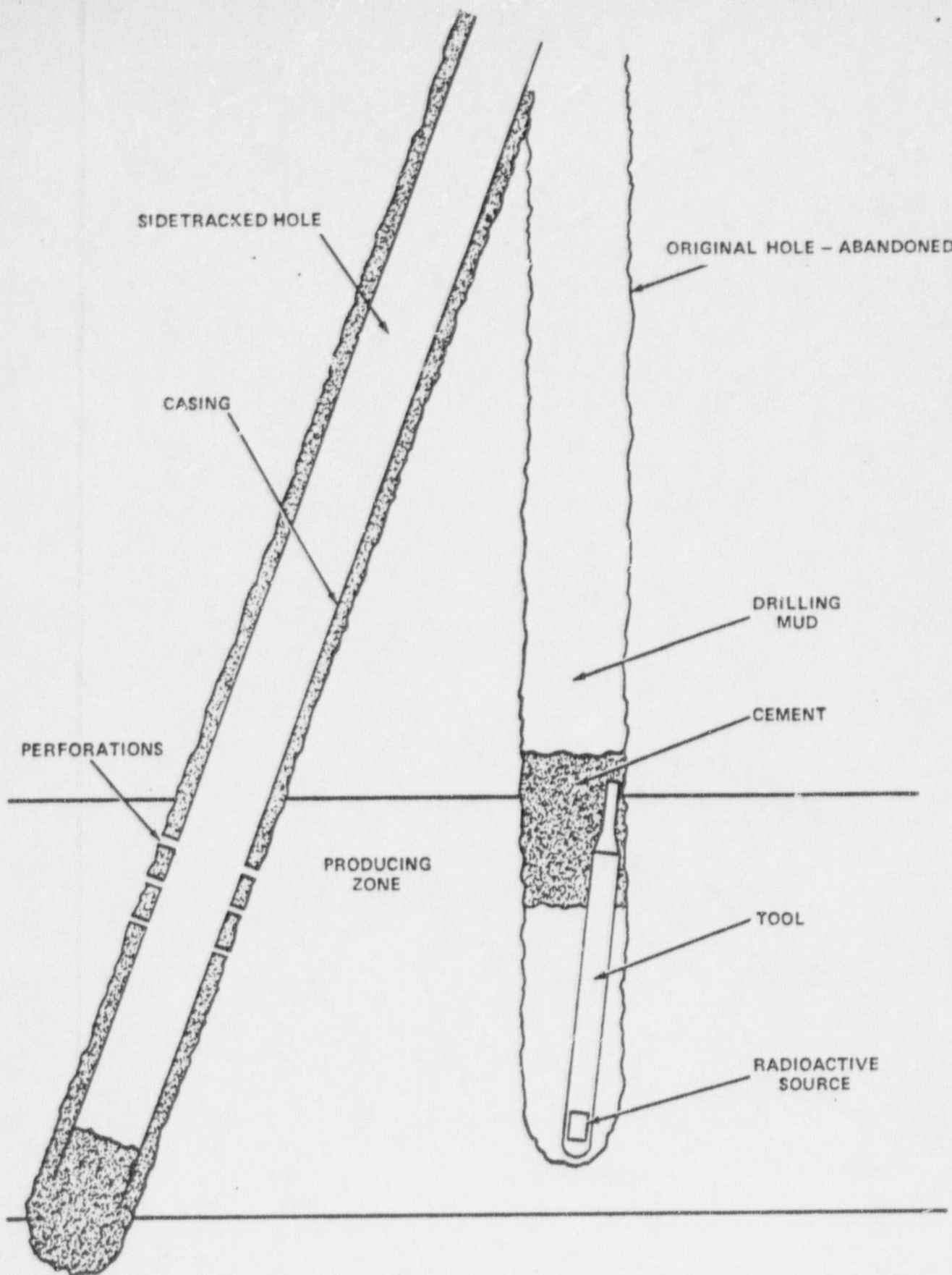
FIGURE #2

[illegible]









FACILITY DRAWING AND SURVEY FORM

SURVEY METER INFO:

Make: _____

Model: _____

Serial No.: _____

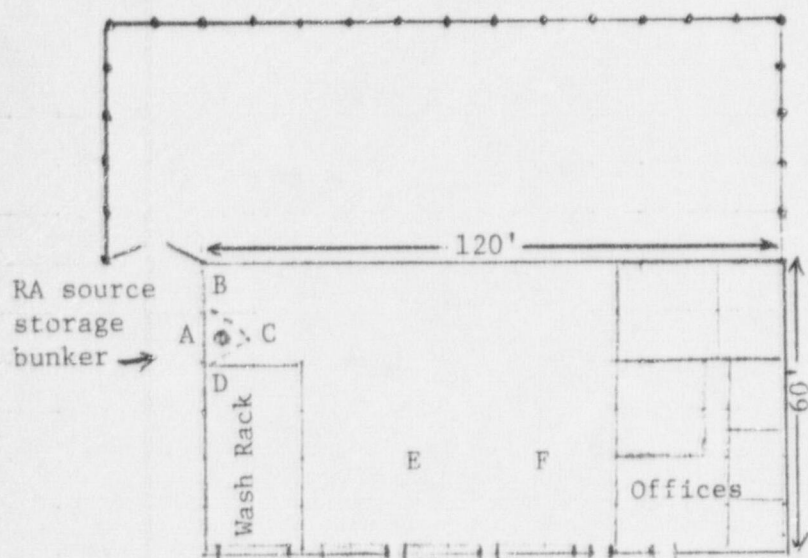
Date of _____

Calibration: _____

SURVEYS		
A		MR/HR
B		MR/HR
C		MR/HR
D		MR/HR
E		MR/HR
F		MR/HR

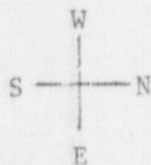
SURVEYED BY: _____

DATE: _____

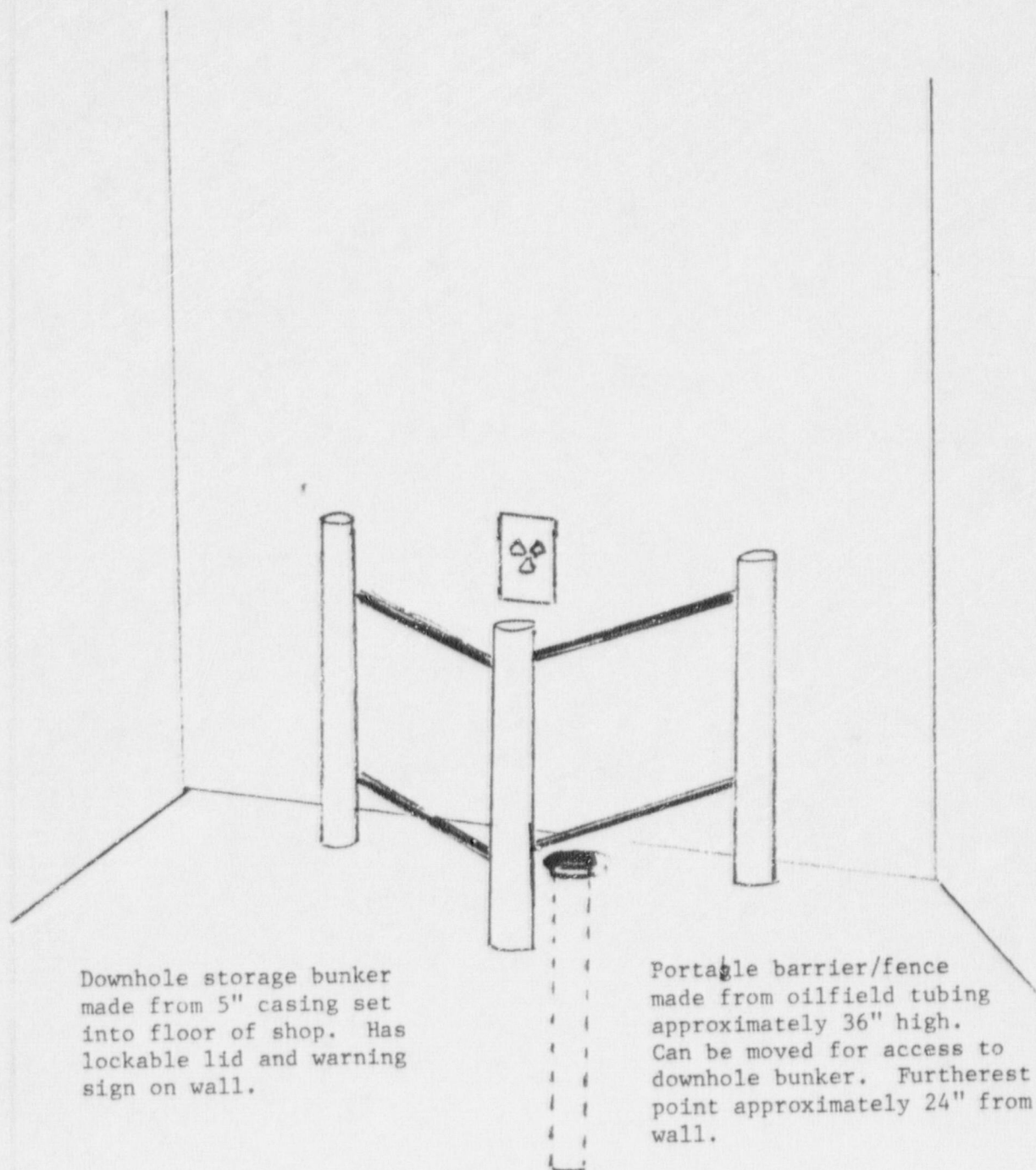


HIGHWAY 64

Approx. 2 miles to Cleveland →



OSAGE WIRELINE, INC.
 Route 3, Highway 64
 Cleveland, OK 74020
 (918) 358-3518

RA STORAGE BUNKER DRAWING

JOB SITE SURVEY & VEHICLE SURVEY

Date: _____

WELL IDENTIFICATION: Name _____ No. _____

LOCATION: Field _____

County _____ State _____

RADIOACTIVE MATERIAL: Source Serial No. _____

Isotope _____ Activity _____

Make and Model _____

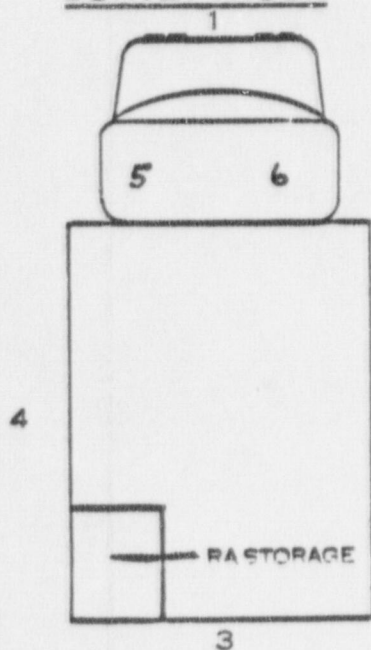
SURVEY METER INFORMATION: Manufacturer _____

Model No. _____ Serial No. _____

Date of Calibration _____

SURVEY TRUCK

Unit No. _____



1 _____ MR

2 _____ MR

3 _____ MR

4 _____ MR

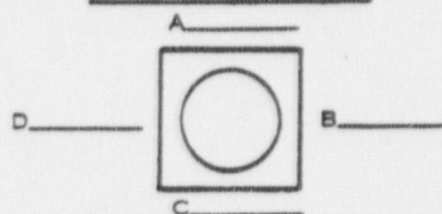
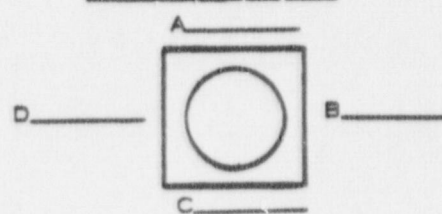
5 _____ MR

6 _____ MR

2

RA STORAGE SURVEY:

_____ MR

WELL HEADBEFORE - MR/HRAFTER - MR/HR

RADIATION SUPERVISOR SIGN HERE: _____

NAMES OF ALL ASSISTANTS AT JOB SITE: _____

APPENDIX A

Annual Inspection Checklist

Well Logging Location _____ Date _____ Time _____
Logging Supervisor _____ Inspector _____
Radioisotope(s) _____ Activity (mCi) _____
Sealed Source Serial Nos. _____
Survey Meter Model No. _____ Serial No. _____ Calibration Due Date _____

Yes

No

1. Was the logging supervisor wearing a film or TLD badge?
2. Were other individuals working within the restricted area wearing film badges or dosimeters?
3. Was the restricted area properly controlled to prevent unauthorized entry?
4. Did the logging supervisor have a calibrated and properly operating survey meter and evidence of its latest calibration?
5. Were the latest survey records as required by paragraphs 39.67(b), (c), and (e) of 10 CFR Part 39 available?
6. Were the shipping papers for transportation of radioactive material available and properly completed?
7. Was the utilization log properly filled out?
8. Did the logging supervisor have sufficient knowledge of safety rules? (Ascertained by oral questions.)
9. Was the logging supervisor working with defective equipment?
10. Were radioactive isotopes stored properly and kept secure to prevent unauthorized removal?
11. Was the storage area posted with "CAUTION (or DANGER) RADIOACTIVE MATERIAL" signs?

Appendix A, continued

Yes

No

12. Did the logging supervisor possess a copy of the applicant's operating and emergency procedures?
13. If operating in an NRC state under reciprocity, was a copy of the Agreement State license available?
14. Were there any incidents which may have required initiation of emergency procedures?
15. Were the emergency procedures properly followed?
16. If necessary in the emergency, were surveys as required by paragraphs 39.67(d) and 39.69(c) conducted and recorded?
17. Were there any items of noncompliance other than those listed on this form? (If any, explain in remarks.)

Remarks _____

Full Name: _____

Date: _____

RADIATION SAFETY EXAMINATION FOR IN HOUSE USE TO EVALUATE WELL LOGGERS

1. Radiation is present in the atmosphere at all times and cannot be detected by man's senses. True? False?
2. _____ is the time required for the activity of a radioactive isotope to decrease (radioactive decay) to half of its initial value.
3. A _____ is a unit of measurement of radioactivity representing 37 Billion disintegrations per second.
4. A _____ is one/thousandth of a Curie.
5. Rem is the unit of measurement expressing radiation exposure dose to _____.
6. The most important considerations for protection from radiation are _____, _____, and _____.
7. According to the inverse square law, if the distance from a source of radiation is twice as far away as before, the intensity is one-fourth as great. True? False?
8. _____ is the thickness of shielding material necessary to reduce the intensity of x-ray or gamma ray to one half of its initial value.
9. A commonly used type of shielding material is _____.
10. Neutron sources are shielded by parafin or other material with a high hydrogen content. True? False?
11. Radioactive materials contained in sealed sources commonly used for well logging operations are _____ (for neutron logging) and _____ (for density logging).
12. Radioactive materials commonly used for tracer studies are _____ and _____.
13. A "logging supervisor" is an individual who _____.
14. A "logging assistant" is an individual who _____.
15. To qualify as a logging supervisor, an individual must have satisfactorily completed training requirements being: _____ approved radiation safety training course for well loggers of at least _____ hours; read and received instruction in applicable _____ and our Operating and Emergency Procedures; and completed _____ months on-the-job training.

16. Regulations require that logging supervisors be inspected _____ at a temporary job site to evaluate job performance.
17. Only radioactive materials specifically authorized by our _____ can be used in our well logging operations.
18. The _____ is responsible for the over-all radiation safety program.
19. NRC regulations specific for well logging operations are found in 10 CFR Part _____.
20. Our radiation safety program is governed by conditions of our radioactive material _____, our _____ manual, and appropriate _____.
21. Three ways to monitor personnel for radiation exposure are _____, _____, and _____.
22. In our operations, we use _____ for personnel monitoring, and they must be worn during all operations which involve possible exposure to radiation.
23. TLD badges must be exchanged at least quarterly. True? False?
24. According to regulations, the total allowable radiation dose to the whole body is _____ rems in one year; _____ rems in one quarter.
25. In the "bank account" formula $5(N-18)$ for determining available exposure, N represents the individual's age. True? False?
26. A 30 year old man has a "bank account" of _____ rems, minus prior exposure, if any.
27. A _____ bunker is recommended for storage of radioactive materials.
28. Signs reading "_____ " must be posted on all four sides of the radiation storage bunker.
29. The radiation level which distinguishes a restricted area from a non-restricted area is _____ mR/hr.
30. How often do regulations require that a physical inventory and inspection of licensed materials be made? _____
31. Leak testing of sealed sources is required once each year. True? False?
32. How often must a survey meter used for well logging be calibrated? _____
33. Geiger-Mueller type survey meters are the most efficient of the three principal types of survey instruments. True? False?
34. On a survey meter, mr/hr means _____.

35. Survey meters used for well logging must measure as high as _____ mR/hr.
36. Survey meters used for well logging must read _____ and _____ radiation.
37. Loading and unloading of source holder assembly must only be done with an approved _____.
38. During efforts to recover a sealed source lodged in the well, _____ must be continually monitored.
39. _____ tool detector may be energized for monitoring for contamination at job site.
40. When it is determined that a sealed source has been ruptured, the RSO must immediately notify _____.
41. Three items of equipment that must be visually checked for defects labeling, and working condition prior to use are _____, _____, and _____.
42. NRC regulations require licensees to transport radioactive materials in compliance with _____ regulations.
43. Well logging sources cannot be transported unless they are in a transport container that meets DOT _____ specifications.
44. Before transporting radioactive materials a radiation survey must be made of each position occupied by personnel and the _____ of the vehicle.
45. The radiation level in the passenger compartment of a vehicle transporting radioactive materials cannot exceed _____ mR/hr.
46. When transporting radioactive materials, _____ must be properly completed, signed and within reach of the driver.
47. The transport index is determined by the survey meter reading of the highest radiation level at a distance of _____ from the exterior of the transport container.
48. A Radiation Yellow III label on the source container indicates that the transport index is more than _____ but less than _____.
49. Vehicles transporting radioactive materials which require a Radiation Yellow III label must be placarded on both sides, the front and the back with placard reading _____.
50. In the event of an emergency involving radioactive materials employees must notify the _____ immediately.