

GUIDE FOR THE PREPARATION OF APPLICATIONS
FOR THE USE OF RADIOACTIVE MATERIALS
IN WELL-LOGGING OPERATIONS

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Nuclear Regulatory Commission
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GUIDE FOR THE PREPARATION OF APPLICATIONS FOR THE USE OF RADIOACTIVE MATERIALS IN WELL-LOGGING OPERATIONS

A. INTRODUCTION

1. Purpose of the Guide

This guide describes the type of information that the NRC staff needs to evaluate an application for the use of radioactive materials in oil, gas, and mineral well-logging operations. The well-logging operations covered by this guide are: (1) the use of the electronic well-logging tools containing sealed sources in wellbores, and (2) the use of radioactive materials to conduct tracer studies in a wellbore or adjacent formation.

2. Applicable Regulations

In addition to 10 CFR Part 30, other regulations pertaining to this type of license are found in 10 CFR Part 19, "Notice, Instructions, and Reports to Workers Inspections"; 10 CFR Part 20, "Standards for Protection Against Radiation"; 10 CFR Part 71, "Packaging of Radioactive Material for Transport and Transportation of Radioactive Materials Under Certain Conditions"; and 10 CFR Part 170, "Fees for Facilities and Material Licenses and Other Regulatory Services Under the Atomic Energy Act of 1954, As Amended."

3. As Low As Is Reasonably Achievable (ALARA)

Paragraph 20.1(c) of 10 CFR Part 20 states, in part, "...persons engaged in activities under licenses issued by the Nuclear Regulatory Commission pursuant to the Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974 should, in addition to complying with the requirements set forth in this part, make every reasonable effort to maintain radiation exposures, and releases of radioactive materials in effluents to unrestricted areas, as low as is reasonably achievable." Regulatory Guide 8.10, "Operating Philosophy

for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable," provides the NRC staff position of this important subject. License applicants should give consideration to the ALARA philosophy, as described in Regulatory Guide 8.10, in the development of plans for work with licensed radioactive materials.

B. LICENSE FEES

A license fee is required for most types of licenses and amendments to licenses. The applicant should refer to Section 170.31, "Schedule of Fees for Materials Licenses and Other Regulatory Services," of 10 CFR Part 170, to determine the amount of fee that must accompany the application. Review of the application will not begin until the proper fee is received by the NRC. Checks should be made payable to the U.S. Nuclear Regulatory Commission.

C. FILING AN APPLICATION

An application for a new license to possess and use byproduct material in well-logging operations should be filed on Form NRC-313, "Application for Material License." Since the space provided on the application form is limited, you should append additional sheets to provide complete information. Rapid evaluation and handling of the application can be facilitated by submitting the information on consecutively numbering pages, 8-1/2 x 11 inches, identifying all drawings or diagrams submitted.

Three copies of the application should be completed. The original and one copy should be mailed to the NRC regional office in which your home office or corporate headquarters is located. The mailing addresses of the NRC regional offices are listed in the 313 Form. Since the license will require, as a condition, that you follow the statements and representations set forth in the application and any supplements to it, one copy of the application with all attachments should be retained for your use.

The information submitted should pertain to the specific activities for which authorization is requested and should be as complete as possible. Submissions

of incomplete information will result in delays because of the correspondence necessary to obtain supplemental information. The submitted information must be sufficient to allow the Commission to determine that the proposed equipment, facilities, trained personnel, procedures, and controls are adequate to protect health and minimize danger to life and property.

The following discussion in Item D, CONTENTS OF APPLICATION, applies to specific terms on Form NRC-313. Each specific item in the guide must be addressed in your application, and when a specific item is not applicable to your proposed program, it must be so stated and your reasons for non-applicability fully explained.

D. CONTENTS OF APPLICATION

Except for Item 1, which is self-explanatory, the following guidance applies to the separate items of Form NRC-313 as indicated:

Item 2 Applicant's Name

The applicant corporation or other legal entity should be specified by name in Item 2 along with the complete mailing address. Individuals should be designated as applicant in Item 2 only if they are acting in a private capacity and the use of byproduct material is not connected with their employment with a corporation or other legal entity.

Item 3 State and Addresses Where Licensed Material Will Be Possessed or Used

The actual location(s) where the radioactive materials will be possessed, stored and/or used should be specified in Item 3. Permanent facilities such as field stations or storage areas where licensed material will be stored or used, from which equipment is dispatched to temporary job sites, should be identified by location (street address, route or highway no., etc.) city and state. An example of a rural location might be "15 miles East, Highway 30, Townville, Montana." Field locations of wells should be specified as "and at temporary job sites."

Item 4 Name and telephone number of Person to be Contacted about the Application

The individual named in Item 4 is normally the person whom management designates to be responsible for the day-to-day operation of the proposed program and is authorized to speak for management regarding any questions that may arise concerning the application or the proposed program.

Item 5 Radioactive material ([a] element and mass number, [b] chemical and/or physical form and [c] maximum amount which will be possessed at any one time).

Under this item, the applicant needs to identify the radioactive materials to be possessed and used under the license. The following are examples of the kinds of listings of licensed material.

Element & Mass No. [a]	Chemical and Physical Form* [b] (Manufacturer and Model No. of Sources)	Maximum activity/source [c]
A. Americium-241:Be	A. Sealed sources (XYZ Inc Model ABC-34)	A. Not to exceed 3 curies per source.
B. Cesium-137	B. Sealed sources (Mesa Blanch, Inc. Model 1.	B. Not to exceed 3 curies per source.
C. Iodine-131	C. Sodium Iodide	C. 30 millicuries total (10 millicuries per study).
D. Tridium-192	D. Baked on glass beads	D. 60 millicuries total (15 millicuries per study).

*Note: The manufacturer and Model number of the sealed sources needs to be listed under subitem [b]. Under subitem [c] it is not necessary to state the number of sources you intend to possess. You need only list the maximum activity per source as in the example. For the tracer materials, list the total quantity to be possessed in [c] and in addition specify the maximum amount of material that will be used for each study as in the above examples.

Item 6 Purpose for which licensed material will be used

Under this item you will need to state the purpose for which each licensed material listed in Item 5 will be used. In particular, you should specify the type of wells in which the material will be used (for example, gas, oil, mineral). The following is an example of the listings for the radionuclides listed in Item 5 above.

- A. For use in oil and gas well logging.
- B. For use in oil and gas well logging.
- C. For use in cement top and cement channel locations in oil and gas wells.
- D. For use as perforation markers in oil and gas wells.

Item 7 Individual(s) responsible for safety program - training and experience (§ 30.33(a)(3), 10 CFR 30)

Under this item you should list:

- (1) The name of the individual responsible for your day-to-day radiation protection program and for assuring compliance with NRC Regulations and the terms and conditions of the license (e.g., your Radiation Protection Officer).

The individual designated as Radiation Protection Officer (RPO) is normally an individual user, supervisor or other individual who will maintain the license and have overall responsibility for the radiation protection program. You should detail the named individual's duties and responsibilities under this item, along with the named individual's training and experience. The RPO is expected to coordinate the safe use of the licensed materials and to ensure compliance with the requirements of Title 10, Code of Federal Regulations, Parts 19, 20, 30, and 71. The minimum duties of the RPO are considered to include the following:

- (a) To ensure that licensed materials that are possessed or used by the applicant are limited to those materials specified in the license.

- (b) To ensure that the licensed materials are used only by those individuals authorized by the license.
- (c) To ensure that all users wear personnel monitoring equipment, such as film badges or thermoluminescence dosimeters (TLD).
- (d) To ensure that licensed material is properly secured against unauthorized removal at all times.
- (e) To supervise leak testing of sealed sources and instrument calibrations.
- (f) To develop operating and emergency procedures and to assist in personnel training and orientation on these procedures.
- (g) To 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 to ensure that proper authorities, for example, NRC, local police, and State personnel, are notified promptly in case of accidents or other incidents that may involve the release of licensed material.
- (h) To ensure that the terms and conditions of the license, such as periodic leak tests, are met; and that the required records, such as personnel exposure records, leak test records, etc., are periodically reviewed for compliance with NRC regulations and the license conditions as listed on the license.
- (i) To conduct radiation safety inspections of licensed activity periodically to ensure compliance with the regulations and license conditions.
- (2) The names of other personnel who will use or directly supervise the use of the licensed material in the performance of well-logging operations under the license (for example, logging supervisors).

The training and experience resume of each individual listed in accordance with the above should be submitted and should include formal academic training

and on-the-job training. The following are considered the subjects that should be included in formal training courses along with the minimum duration of formal training courses and on-the-job training.

SUBJECTS TO BE INCLUDED IN TRAINING COURSES FOR LOGGING SUPERVISORS

- I. Fundamentals of Radiation Safety.
 - A. Characteristics of radiation.
 - B. Units of radiation dose and quantity of radioactivity.
 - C. Hazards of exposure to radiation.
 - D. Levels of radiation from licensed material.
 - E. Methods of controlling radiation dose.
 - 1. Working time.
 - 2. Working distances.
 - 3. Shielding.
- II. Radiation Detection Instrumentation To Be Used.
 - A. Use of radiation survey instruments.
 - 1. Operation.
 - 2. Calibration.
 - 3. Limitations.
 - B. Survey techniques.
 - C. Use of personnel monitoring equipment.
- III. Equipment to be Used.
 - A. Handling equipment and remote handling tools.
 - B. Licensed materials.
 - C. Storage control, and disposal of equipment and licensed materials.
 - D. Operation and control of equipment and licensed materials.
 - E. Maintenance of equipment.
- IV. The Requirements of Pertinent Federal and State Regulations.

- V. The Licensee's Written Operating and Emergency Procedures.
- VI. The Licensee's Recordkeeping Procedures.
- VII. Case Histories and Potential Consequences of Accidents in Well-Logging Operations.

MINIMUM REQUIREMENTS

Formal training should encompass all of the above subjects and should be, as a minimum, approximately 24 hours duration. The trainee should show evidence of satisfactory completion of this training by a written or oral test.

Formal on-the-job training should be, as a minimum, approximately three months duration working under the direct supervision of an approved user who has been specifically named on an NRC or Agreement State license. Following the on-the-job training period, the trainor should be able to attest to the fact that the trainee has demonstrated a clear and concise understanding of the duties and responsibilities of the job.

Item 8 Training of individuals working in or frequenting restricted areas.
(Pursuant to requirements of § 19.12, 10 CFR 19.)

For this item, you will need to specify that all employees (including ancillary employees) who frequently any restricted area (e.g., your storage and use areas, field use areas and temporary job sites) will be given periodic instruction in basic radiation safety principles and be instructed in your own radiation safety program.

Item 9 Facilities and equipment. (§ 30.33, (a), (2), 10 CFR 30)

- A. Radiation Detection Instruments and Instrument Calibration (for performance of surveys required pursuant to § 20.201, 10 CFR 20). Section 20.201 of 10 CFR 20 requires each licensee to make surveys as necessary to evaluate the extent of radiation hazards that may be present during

possession and use of licensed material. Therefore, you need to provide information on the instrumentation to be used for performing surveys.

Well-logging licensees are required to maintain calibrated and operable radiation survey instruments at each field station to make radiation surveys at the field station and at each temporary job site as required by the regulations. The radiation survey instruments must be capable of measuring beta-gamma exposure from 0-20 milliroentgens per hour.

List the radiation survey instruments available for use in performing the required surveys. List by (a) type of instrument, (b) number available, (c) radiation's detected and (d) sensitivity range.

An example of such a listing is as follows:

RADIATION DETECTION INSTRUMENTS

TYPE	NUMBER AVAILABLE	RADIATION DETECTED	SENSITIVITY RANGE
Portable Thin Window GM survey meter	2	beta, gamma	0-500 mr/hr

You will need to specify how the listed instruments will be periodically calibrated. Well-logging licensees are required to have their survey instruments calibrated:

- (1) At intervals not to exceed six (6) months and after each instrument servicing.
- (2) At energies and radiation levels appropriate for use.
- (3) So that accuracy within 20 percent of the true radiation level can be demonstrated on each scale.

Calibration records for each survey meter shall be maintained for a period of two (2) years from the date of calibration of inspection by the Commission.

Usually, calibration services are obtained from either the instrument manufacturer or a licensed service company. If you plan to use this method, you will need to only specify this.

If, however, you intend to establish your own in-house survey meter calibration program, you should so state and provide the additional information as outlined in the attached Appendix A.

B. Personnel Monitoring (pursuant to § 20.202, 10 CFR 20)

Section 20.202, 10 CFR 20, specifies the requirement for personnel monitoring. Film badges or thermoluminescence dosimeters (TLD) are normally required for personnel engaged in well-logging operations. These devices are available from commercial suppliers. Monthly exchange and evaluation for film badge devices is an acceptable practice. Quarterly exchange is acceptable for TLD. Note that it is no longer necessary to specify the name of the commercial service company providing your personnel monitoring devices. However, it is important to note that if americium-beryllium or other neutron sources are used in your program, your service company must provide neutron dosimetry service to your personnel. Records of personnel monitoring shall be maintained in accordance with Section 20.401, 10 CFR 20. An acceptable example for the completion of this Item is in the following:

PERSONNEL MONITORING DEVICES		
TYPE (Check and/or complete as appropriate.) A	SUPPLIER (Service Company) B	EXCHANGE FREQUENCY C
<input type="checkbox"/> (1) FILM BADGE or	Service will be obtained from a commercial service company. Neutron monitoring will be provided if Americium-241:Be neutron sources are authorized	(maximum)
<input type="checkbox"/> (2) THERMOLUMINESCENCE DOSIMETER (TLD)		<input type="checkbox"/> MONTHLY for film badges
<input type="checkbox"/> (3) OTHER (Specify): _____ _____ _____		<input type="checkbox"/> QUARTERLY for <input type="checkbox"/> OTHER (Specify): _____ _____

Well-logging licensees must not permit an individual to use licensed material (i.e., to act as a logging supervisor or logging assistant) unless the individual wears, at all times during operation, either a film badge or a thermoluminescence dosimeter (TLD) that is capable of measuring radiation exposure from the licensed material in use. Each film badge or TLD dosimeter must be assigned to and worn by only one individual.

C. Physical Facilities and Equipment (Pursuant to § 30.33[a][2] 10 CFR 30)

Well-logging licensees are required to maintain sufficient facilities and equipment adequate to protect health and minimize danger to life or property. Therefore, you should provide the information on your facilities as indicated below.

INFORMATION ON FACILITIES AND EQUIPMENT TO BE INCLUDED

1. Sketch(es) and/or description(s) of your field station(s) and facilities where radioactive materials are stored or used, and from which equipment is dispatched to temporary job sites. Sketches should include, where

applicable: building(s), boundary lines, security fences, designated areas, locked storage areas and distances to accessible areas not under the applicants control. Sketches should be to rough scale and all dimensions indicated.

2. Sketch(es) and/or descriptions of your locked storage containers or underground storage pits maintained at your facility. Methods of preventing unauthorized removal and/or use of licensed material should be indicated on the sketch or otherwise specified.
3. Sketch(es) and/or descriptions of transport containers to be used for transporting both gamma and neutron logging sources to and from temporary job sites. You should specify the maximum activity that will be transported in each type transport container that you include in this submission. Furthermore, descriptions and/or sketches should clearly indicate how the transport contains are to be locked and physically secured to the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal of the licensed material from the vehicle.
4. Sketch(es) and/or descriptions of the remote tools you will use to transfer source to and from storage containers and well-logging tools and for handling tracer shipments. CAUTION - SOURCES MUST NOT BE HANDLED WITH BARE HANDS.

NOTE: The following additional information is to be supplied by the applicant only if the applicant requests the use of radioactive tracer materials (unsealed radionuclides such as iodine-131, iridium 192, etc.) in the well-logging operations.

5. Facilities and equipment for tracer injection sample preparation. If tracer samples are not to be purchased in ready to use form, laboratory or field office facilities that are to be maintained as restricted areas for sample preparation should be described. Sketches are helpful. Hoods, sinks, trays with absorbent materials, remote handling tools, rubber gloves, etc., that will be available at these laboratory sites should also be described.

6. Storage provisions. The description of storage facilities should include drawings or sketches of the rooms, building, pits, etc., showing shielding materials (concrete, steel, lead, earth, etc.) and means for securing materials from unauthorized removal. Storage facilities should be designed and materials positioned so that radiation levels do not normally exceed 2 mR per hour at 18 inches from the exterior surface of the storage facility.
7. General safety equipment. A description of protective clothing (such as rubber gloves, coveralls, respirators, and face shield), auxiliary shielding, absorbent materials, injection equipment, secondary containers, plastic bags for storing contaminated clothing, tissue, handling tools, etc., that will be available at well sites should be submitted.

Item 10 - Radiation Safety Program

The following are considered radiation safety requirements that need to be addressed by you in making application for a license to engage in well-logging (wireline) service operations and subsurface tracer studies. Each specific subitem of Item 10 discusses requirements to which you must agree to abide by in your operations, or explain precisely why you do not agree by offering a reasonable alternative. If, for example, you feel that a particular item does not apply to your proposed operation, you should say so and offer a full explanation and/or your alternative(s). You will need to provide the information for Item 10 on additional 8 1/2 by 11 inch paper, properly keyed to this item and its respective subitems. It is requested that you address each subitem of Item 10 in the order presented in this section of the guide in order to facilitate the application review process.

Item 10.1

PROHIBITION

You must agree not to perform wireline service operations with a sealed source(s) in any well or wellbore unless, prior to commencement of the operation, you have a written agreement with the well operator, well owner, drilling contractor, or land owner that:

- (a) In the event a sealed source is lodged downhole, a reasonable effort at recovery will be made.
- (b) In the event a decision is made to abandon the sealed source downhole, the requirements of Item 10.6.1 of this application shall be met.

Item 10.2

EQUIPMENT CONTROL

Item 10.2.1 - Limits on Levels of Radiation

You must agree that sources of radiation shall be used, stored and transported in such a manner that the transportation requirements of 10 CFR 71, and the dose limitation of Sections 20.101-20.106 of 10 CFR 20, as applicable, are met.

Item 10.2.2 - Storage Precautions

You must agree that:

- (a) Each source of radiation, except accelerators, shall be provided with a storage and/or transport container. The container shall be provided with a lock (or tamper seal for calibration sources) to prevent unauthorized removal of or exposure to the sources of radiation.
- (b) Sources of radiation shall be stored in a manner which will minimize danger from explosion and/or fire.

Item 10.2.3 - Transport Precautions

You must agree that transport containers shall be physically secured to the transport vehicles to prevent accidental loss, tampering, or unauthorized removal.

Item 10.2.4 - Radiation Survey Instruments

- (a) You must agree to maintain sufficient calibrated and operable radiation survey instruments at each field station to make physical radiation surveys as required by Section 20.201, 10 CFR 20, and the commitment made in Section 10.5.1 of this application. Instrumentation shall be capable of measuring 0.1 milliroentgen per hour through at least 20 milliroentgens per hour.
- (b) You must agree that each radiation survey instrument shall be calibrated:
 - 1. At intervals not to exceed six months and after each instrument servicing.
 - 2. At energies and radiation levels appropriate for use.
 - 3. So that accuracy within plus or minus 20 percent of the true radiation level can be demonstrated on each scale.
- (c) You should further agree that calibration records shall be maintained for a period of two years for inspection by the NRC.

Item 10.2.5 - Leak Testing of Sealed Sources

You must agree that each sealed source of radioactive material shall be tested for leakage in accordance with the items listed below. Records of leak test results will be kept in units of microcuries and maintained for six (6) months after the next required leak test is performed or until transfer or disposal of the sealed source.

(a) Method of Testing

Tests for leakage shall be performed only by personnel specifically authorized to perform such tests by the U.S. Nuclear Regulatory Commission or an Agreement State. The test sample shall be taken from the surface of the source, source holder, or from the surface of the device in which the source is stored or mounted, and on which one might expect contamination to accumulate. The test sample shall be analyzed for radioactive contamination, and the analysis shall be capable of detecting the presence of 0.005 microcurie of radioactive material on the test sample. (Note that if you propose to use an approved leak test kit to perform leak tests, you will need to state this and provide the name of the manufacturer of the leak test kit and the manufacturer's model number of the kit.)

(b) Interval of Testing

Each sealed source of radioactive material shall be tested at intervals not to exceed six months. In the absence of a certificate from a transferor indicating that a test has been made prior to the transfer, the sealed source shall not be put into use until tested. If, for any reason, it is suspected that a sealed source may be leaking, it shall be removed from service immediately and tested for leakage as soon as practical.

(c) Leaking or Contaminated Sources

If the test reveals the presence of 0.005 microcurie or more of leakage of contamination, then you shall agree to immediately withdraw the source from use and shall cause it to be decontaminated, repaired, or disposed of in accordance with Section 20.301, 10 CFR 20.

A report describing the equipment involved, the test results, and the corrective action taken shall be filed with the appropriate NRC Region in which the license is issued.

Item 10.2.6 - Periodic Inventory of Sources of Radiation

You must agree to conduct a periodic physical inventory (at intervals not to exceed six [6] months) to account for all sources of radiation possessed under the license. Records of inventories shall be maintained for two (2) years from the date of inventory for inspection by the NRC and shall include the quantities and kinds of sources of radiation, the location where sources are assigned, the date of the inventory, and the name of the individual conducting the inventory.

Item 10.2.7 - Utilization Records

You must agree to maintain current records, which shall be kept available for inspection by the agency for two years from the date of the recorded event, showing the following information for each source of radiation:

- (a) Make, model number, and a serial number or a description of each source of radiation used.
- (b) The identity of the well-logging supervisor or field unit to whom assigned.
- (c) Locations where used and dates of use.
- (d) In the case of tracer materials and radioactive markers, the utilization record shall indicate the radionuclide and activity used in a particular well.

Note that a copy of or facsimile of your utilization log should be submitted also under this section.

Item 10.2.8 - Labeling [pursuant to 10 CFR 20.203(f)]

You must agree to abide by the following labeling requirements:

- (a) 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.

- (b) Each transport container shall 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 NAME OF YOUR COMPANY)

Item 10.2.9 - Inspection and Maintenance

- (a) You must agree to conduct, at intervals not to exceed six months, a program of inspection and maintenance of source holders, logging tools, source handling tools, storage containers, transport containers, and injection tools to assure proper labeling and physical condition. Records of inspection and maintenance shall be maintained for a period of two years for inspection by the NRC.
- (b) You must further agree that if any inspection conducted pursuant to the above reveals damage to labeling or components critical to radiation safety, the device shall be removed from service until repairs have been made and that ... (c).

- (c) The repair, opening, or modification of any sealed source, or the non-routine servicing* and maintenance of equipment such as the removal of source capsules from source holders, repair and replacement of seals on source holder/pressure housings, etc. shall be performed only by persons specifically authorized to do so by the U.S. Nuclear Regulatory Commission or an Agreement State.

Item 10.3 REQUIREMENTS FOR PERSONNEL SAFETY

Item 10.3.1 - Training Requirements

- (a) You must agree not to permit an individual to use byproduct material until such individual has:
1. Received, in a course recognized by the U.S. Nuclear Regulatory Commission or an Agreement State, instruction in the subjects outlined in Item 7 of this guide and demonstrated an understanding thereof.
 2. Read and received instruction in the commitments contained in your application and the applicable regulations contained in 10 CFR 19, 20, 30, and 71, and conditions of the NRC issued license, and your operating and emergency procedures, and demonstrated an understanding thereof.
 3. Demonstrated competence to use sources of radiation, related handling tools, and radiation survey instruments which will be used on the job.

*Note: If wish to request authorization to perform such non-routine services as indicated in 10.2.9(c) above, you will need to describe the specific services you wish to perform and provide step-by-step procedures for the performance of these non-routine services, including a description of any special tools that will be used to minimize personnel exposure. Sources and source holder/pressure housings should never be handled with the bare hands. You are reminded that where specific approval for non-routine servicing of source holders or pressure housings containing the source have not been requested and subsequently granted under the license, you will be required to return the items to the device manufacturer or other persons specifically licensed to perform such non-routine services.

(b) You must agree that no individual shall be permitted to assist in the handling of sources of radiation until such individual has:

1. Read or received instruction in our operating and emergency procedures and demonstrated an understanding thereof.
2. Demonstrated competence to use, under the personal supervision of the logging supervisor, the sources of radiation, related handling tools and radiation survey instruments which will be used on the job.

(c) You must further agree that you shall maintain employee training records for inspection by the NRC for two years following termination of employment.

Item 10.3.2 - Operating and Emergency Procedures

You must agree that each individual who will use or supervise the use of licensed material will be provided with a set of operating and emergency procedures. These procedures shall include instruction in at least the following:

- (a) Handling and use of sources of radiation to be employed so that no individual is likely to be exposed to radiation doses in excess of the limits established in the appropriate Sections of 20.101-20.106, 10 CFR 20.
- (b) Methods and occasions for conducting radiation surveys. (See also 10.5.1.)
- (c) Methods and occasions of locking and securing sources of radiation.
- (d) Personnel monitoring and the use of personnel monitoring equipment.
- (e) Transportation to temporary jobsites and field stations, including the packaging and placing of sources of radiation in vehicles, placarding of vehicles, and securing sources of radiation during transportation.

- (f) Minimizing exposure of individuals in the event of an accident.
- (g) Procedures for notifying proper personnel in the event of an accident.
- (h) Maintenance of records.
- (i) Inspection and maintenance of source holders, logging tools, source handling tools, storage containers, transport containers, and injection tools.
- (j) Procedure to be followed in the event a sealed source is lodged downhole.
- (k) Procedures to be used for picking up, receiving, and opening packages containing radioactive material pursuant to Section 20.205, 10 CFR 20.
- (l) The procedures to be used for site and equipment surveys and decontamination following tracer studies.

It is not necessary that you submit copies of your operating and emergency procedures. You need only state that will provide a set of procedures as required by 10.3.2 and restate the elements which will be included in them as specified above.

Item 10.3.3 - Personnel Monitoring (as required by § 20.202)

- (a) Film badges/Thermoluminescence dosimeters.

You must agree not to permit an individual to use licensed material or to assist in the handling of sources of radiation unless each individual wears, all times during operation, either a film badge or a thumoluminescence dosimeter (TLD) that is capable of measuring radiation exposure from the lciensed material. This implies that where both gamma and neutron well-logging sources are used, the film badges or TLD dosimeters must be capable of measuring both gamma and neutron radiation exposure. Each film badge or TLD dosimeter shall be assigned to and worn by only one

individual. Film badge or TLD processing is required at no longer than monthly intervals for film badges and quarterly intervals for TLD dosimeters.

- (b) Bioassay services required for use of tracer materials (pursuant to the requirements of § 20.108, 10 CFR 20)

Where your proposed program requires the use of large amounts of radioactive material in uncontained form, for example, well tracers, you will need to address under this section of your application what provisions will be made for the performance of bioassays on your user personnel. A typical example is that if you will require the use of iodine-131 in your proposed program and the maximum activity to be handled by any one of your personnel will exceed 50 millicuries per week, you will need to address under this section of the application what provisions you will make to perform appropriate bioassays on these individuals as specified in Regulatory Guide 8.20. A copy of Regulatory Guide 8.20 may be obtained from any of the NRC regional offices listed in Appendix D of 10 CFR 20.

- (c) You must agree that your personnel monitoring records will be maintained for inspection until the NRC authorizes disposition (pursuant to the requirement of § 20.401(c)(1), 10 CFR 20).

Item 10.4 PRECAUTIONARY PROCEDURES IN LOGGING AND SUBSURFACE TRACER OPERATIONS

Item 10.4.1 - Security

You must agree that during each logging or tracer application, the logging supervisor or other designated employee shall maintain direct surveillance of the operation to protect against unauthorized and/or unnecessary entry into a restricted area, as defined in Section 20.3(a)(14), 10 CFR 20.

Item 10.4.2 - Handling Tools

You must agree to provide and require the use of tools that will assure remote handling of sealed sources other than the low activity calibration sources.

Item 10.4.3 - Subsurface Tracer Studies

- (a) You must agree to require the use of protective gloves and other protective clothing and equipment by all personnel handling radioactive tracer material. Precautions shall be taken to avoid ingestion or inhalation of radioactive material.
- (b) You must agree to not cause the injection of radioactive material into potable water aquifers without prior written authorization from the NRC.

Item 10.4.4 - Particle Accelerators (Note: This item may be disregarded as not applicable if tritium as targets and/or accelerator tubes containing tritium are not required under Item 5, Radioactive Material, of your application.)

If particle accelerators containing tritium targets are required in your program, you must agree to not permit above-ground testing of particle accelerators, designed for use in well-logging, which results in the production of radiation, except in areas or facilities controlled or shielded so that the requirements of Section 20.101 and 20.105, 10 CFR 20, are met.

Item 10.5 RADIATION SURVEYS AND RECORDS

Item 10.5.1 - Radiation Surveys (required pursuant to Sections 20.201 and 20.401, 10 CFR 20)

You must agree to perform radiation surveys and maintain records as indicated below:

- (a) Radiation surveys and/or calculations shall be made and recorded for each area where radioactive materials are stored.
- (b) Radiation surveys and/or calculations shall be made and recorded for the radiation levels in occupied positions and on the exterior of each vehicle used to transport radioactive material. Such surveys and/or calculations shall include each source of radiation or combination of sources to be transported in the vehicle.

- (c) After removal of the sealed source from the logging tool and before departing the jobsite, the logging tool detector shall be energized, or a survey meter used, to assure that the logging tool is free of contamination.
- (d) Radiation surveys shall be made and recorded at the jobsite or wellhead for each tracer operation, except those using hydrogen-3, carbon-14, and sulfur-35. These surveys shall include measurements of radiation levels before and after the operation.
- (e) Records required pursuant to (a) through (d) above shall include the dates, the identification of individual(s) making the survey, the identification of survey instrument(s) used, and an exact description of the location of the survey. Records of these surveys shall be maintained for inspection by the agency for two years after completion of the survey.

Item 10.5.2 - Documents and Records at Field Stations Listed in Item 3

You must agree to maintain, for inspection by the NRC, the following documents and records for the specific devices and sources used at your field station listed in Item 3 of your application:

- (a) Copy of the NRC license.
- (b) Operating and emergency procedures.
- (c) Applicable regulations.
- (d) Records of the latest survey instrument calibrations you specified in Item 9.A.
- (e) Records of the latest leak test results you specified in Item 10.2.5.
- (f) Inventories required in accordance with Item 10.2.6.
- (g) Utilization records required in accordance with Item 10.2.7.

- (h) Records of inspection and maintenance required in accordance with Item 10.2.9.
- (i) Survey records required in accordance with Item 10.5.1 of your application.

Item 10.5.3 - Documents and Records at Temporary Job Sites

You must agree that, when conducting operations at a temporary jobsite, you shall have the following documents and records available at that site for inspection by the NCR:

- (a) Operating and emergency procedures.
- (b) Survey records required in accordance with Item 10.5.1 of your application for the period of operation at the site.
- (c) Evidence of current calibration for the radiation survey instruments in use at the site.
- (d) When operating in an Agreement State under reciprocity, a copy of your NRC license.

Item 10.6 NOTIFICATION

Item 10.6.1 - Notification of Incidents, Abandonment, and Lost Sources

You must agree to abide by the notification procedures and precautions outlined in (a) through (e) below:

- (a) Notification of incidents and sources lost in other than downhole logging operations shall be made in accordance with appropriate provisions of Sections 20.403 and 20.405, 10 CFR 20.

(b) Whenever a sealed source or device containing radioactive material is lodged downhole you shall:

1. Provide the drill rig operator and the fishing service company with a complete description of the tool and the location of the source in the tool.
2. Advise the drill rig operator and fishing service company against using any fishing techniques which may damage the source in the tool.
3. Continuously monitor the wellhead and any well circulating fluids (drilling mud, etc.) during all fishing operations to check for any surface contamination resulting from downhole source damage. This monitoring should be accomplished utilizing a sensitive beta-gamma survey meter. The sensitive gamma scintillation detector that is contained in a well-logging tool may also be used and may be preferable for this surface contamination monitoring. Any instrument readings above background should be considered evidence of source damage.
4. In the event of any evidence of downhole source damage, immediately notify the drill rig operator and fishing service company to cease all operations, restrict the flow of drilling fluids through the downhole fluid circulatory system, and make attempts to separately isolate and contain the fluids coming from the wellhead. The well-logger should also notify the Radiation Protection Officer who should then immediately notify the nearest NRC Regional Office listed in Appendix D, 10 CFR 20, of the situation.

(c) When it becomes apparent that efforts to recover the radioactive source will not be successful, you shall:

1. Advise the well-operator of requirements for abandonment and an appropriate method of abandonment, which shall include:

- (i) The immobilization and sealing in place of the radioactive source with a cement plug.
 - (ii) The setting of a whipstock or other deflection device.
 - (iii) The mounting of a permanent identification plaque, at the surface of the well, containing the appropriate information required by (d) below.
- 2. Notify the appropriate Region listed in Appendix D, 10 CFR 20, by telephone, giving the circumstances of the loss, and request approval of the proposed abandonment procedures.
- 3. File a written report with the Region within 30 days of the abandonment, setting forth the following information:
 - (i) Date of occurrence and a brief description of attempt to recover the source.
 - (ii) A description of the radioactive source involved, including radionuclide, quantity, and chemical and physical form.
 - (iii) Surface location and identification of well.
 - (iv) Results of efforts to immobilize and set the source in place.
 - (v) Depth of the radioactive source.
 - (vi) Depth of the top of the cement plug.
 - (vii) Depth of the well.
 - (viii) Information contained on the permanent identification plaque.

- (d) Whenever a sealed source containing radioactive material is abandoned downhole, you shall provide a permanent plaque for posting the well or wellbore. This plaque shall:
1. Be constructed of long-lasting material, such as stainless steel or monel.
 2. Contain the following information engraved on its face:
 - (i) The word "CAUTION."
 - (ii) The radiation symbol without the conventional color requirement.
 - (iii) The date of abandonment.
 - (iv) The name of the well operator or well owner.
 - (v) The well name and well identification number(s) or other designation.
 - (vi) The sealed source(s) by radionuclide and quantity of activity.
 - (vii) The source depth and the depth to the top of the plug.
 - (viii) An appropriate warning, depending of the specific circumstances of each abandonment. (Note that appropriate warnings may include: [a] "Do not drill below plug back depth;" [b] "Do not enlarge casing;" or [c] "Do not re-enter the hole," followed by the words, "before contacting the Nuclear Regulatory Commission.")
- (e) You shall immediately notify the agency by telephone and subsequently by confirming letter if you know of, or have reason to believe that, radioactive material has been lost in, or to an underground potable water source. Such notice shall designate the well location and shall describe the magnitude and extent of loss of radioactive material, assess the consequences

of such loss, and explain efforts planned or being taken to mitigate these consequences.

Item 11 - Waste Management

The applicant is required to dispose of licensed material pursuant to Section 20.301, 10 CFR 20.

(a) Sealed Sources

Sealed sources containing licensed material should be transferred only to a licensee authorized to possess the specific quantity and form being transferred.

(b) Tracer Materials and Wastes

Wastes from tracer operations such as unused materials (material not injected into wells), contaminated tissues, gloves, tools, clothing, containers, etc., shall be disposed of in accordance with the requirements of Sections 20.301-20.306 of 10 CFR 20. Short half-life materials (e.g., iodine-131) may be stored to allow decay to background levels prior to disposal by ordinary means. The licensee is required to provide security during storage so that radiation levels outside the restricted storage area do not exceed the levels specified in Section 20.105, 10 CFR 20. Prior to disposal of material in ordinary trash, the licensee must monitor each waste package in a low background area (away from other radioactive materials), deface all radioactive label markings on each package and make a record of such disposals showing that the specific package did not register above background levels on an appropriate beta-gamma survey meter.

A commonly used method of disposal is transfer to a commercial firm licensed to accept radioactive wastes. Lists of these firms are available from the Commission on request. In dealing with these firms, prior contact is recommended to determine the specific services that will be provided.

The applicant may complete Item 11 by agreeing to dispose of all radioactive waste in the following manner and so stating under this section of the application.

Waste Management

- (a) Sealed sources will be disposed of by return to the manufacturer or by transfer to a commercial waste disposal service specifically licensed by the NRC or an Agreement State.
- (b) Tracer material wastes will be disposed of by transfer to a commercial waste disposal service specifically licensed by the NRC or an Agreement State. Short half-life waste may be held for decay to background levels, as measured by a beta-gamma GM survey meter, prior to disposal as regular trash.
- (c) Records of waste disposal will be maintained pursuant to Section 20.401(c)(3), 10 CFR 20. Shipment manifests will be prepared and maintained in accordance with § 20.311, 10 CFR 20.

Item 12 - Certificate

You should have an official representative, e.g., President, Department or Division Head, or other person you have authorized to sign official documents, sign and date your application, to certify that your application contains information that is true and correct to the best of your knowledge and belief. We will return applications that you have not signed, for proper signature.

E. AMENDMENTS TO LICENSES

Licensees are required to conduct their programs in accordance with statements, representations, and procedures contained in the license application and supportive documents. The license must therefore be amended if you plan to make any changes or modifications in facilities, equipment, procedures, personnel, or licensed material to be used.

Applications for license amendments may be filed either on the application form or in letter form. Your application for amendment should identify the license by number, and should clearly describe the exact nature of the changes, modifications, additions, or deletions. References to previously submitted information and documents should be clear and specific and should identify the pertinent information by date, page, and paragraph.

The appropriate fee for license amendment, as listed in 10 CFR Part 170, must accompany your application.

F. RENEWAL OF A LICENSE

Byproduct material licensees are normally issued for a period not to exceed five years.

An application for renewal may be submitted in its entirety without reference to previously submitted information.

As an alternative, you may do the following:

1. Review your current license to determine that the information concerning your sealed sources, tracer materials, places of use, etc., accurately represents your current and anticipated program. Identify any additions, deletions, or other changes. For additions or other changes, you must prepare information appropriate for the required additions or changes.
2. Review the documents you have submitted in the past to determine that the information in them is up-to-date and accurately represents your management control program, facilities, equipment, personnel, radiation safety procedures, location(s) of use, and any other information pertinent to your program. The documents which you consider to be those which represent your current program, should be identified by date. Any out-of-date and superseded documents should also be identified. (Those documents which

you have submitted in the past which are part of your license are referenced in your current license.) Changes should be made in the documents, as necessary, to reflect your current program.

3. Review NRC regulations to assure that any changes in the regulations are appropriately covered in your program description.
4. After you have completed your review, you should submit a letter, in duplicate, with proper fee, which requests renewal of your license and which provides the information specified in Items 1, 2, and 3, as necessary.
5. Include the name and telephone number of the person who may be contacted concerning your renewal application, and include your correct mailing address if it is not indicated correctly on your license.

If your application for license renewal is filed at least thirty (30) days before the expiration date of your license and the application is accompanied by the appropriate fee for license renewal, your license will automatically remain in effect until final action is taken on your application. However, if your application is filed less than thirty (30) days before the expiration date and it cannot be processed before that date, you could be without a valid license when the license expires.

It is important that the appropriate fee for license renewal accompany your application for license renewal. In accordance with Section 170.12 of 10 CFR Part 170, no application will be accepted for filing or will be processed before the proper fee is paid.

If you do not wish to renew your license, you must dispose of all licensed radioactive material in your possession in a manner authorized in 10 CFR Part 20; complete Form NRC-314, "Certificate of Disposition of Materials," and return it before the expiration date of your license with a request that your license be terminated. If you cannot dispose of all licensed radioactive material in your possession before the expiration date, you

must request a license renewal for storage only for the radioactive material to avoid violations of possessing licensable material without a valid license.

ATTACHMENTS: (1) Appendix A

In-House Calibration of Survey Instruments

APPENDIX A

SURVEY INSTRUMENT CALIBRATIONS

If you have indicated in Item 9.A. that survey instruments will be calibrated in-house then the following outlines the additional information that must be provided on your proposed calibration program:

Additional Information For Item 11b

1. Calibration source(s) to be used: (Provide the following information on each source to be possessed and used for calibration purposes.)

Radionuclide: _____

Manufacturer's name: _____

Model No: _____

Activity (for example, millicuries): _____, and
Output (for example, R/hr at 1 meter): _____

Accuracy* of the source(s): _____

2. Frequency of calibration: _____ months
3. Specific procedure to be used (include radiation safety procedure to be followed during handling and use of source[s]).
4. An example of your calibration record form.
5. Calibrations will be performed by: _____
6. Pertinent training and experience of person(s) named above.

*Note that the accuracy is the maximum deviation of the nominal value of the source from the true value. This information is usually provided by the manufacturer of the source(s) along with a statement on the traceability to a national standard.

12-24320-01 12475

NRC Form 313 I (12-81) 10 CFR 30		U.S. NUCLEAR REGULATORY COMMISSION		1. APPLICATION FOR: (Check and/or complete as appropriate)	
APPLICATION FOR BYPRODUCT MATERIAL LICENSE INDUSTRIAL				XX a. NEW LICENSE	
				b. AMENDMENT TO: LICENSE NUMBER	
				c. RENEWAL OF: LICENSE NUMBER	
See attached instructions for details. Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.					
2. APPLICANT'S NAME (Institution, firm, person, etc.) UNITED WIRELINE SERVICE, INC. TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION 618-842-7838		3. NAME AND TITLE OF PERSON TO BE CONTACTED REGARDING THIS APPLICATION CARL W HUBBARTT, PRES. & MANAGER TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION 842-7838			
4. APPLICANT'S MAILING ADDRESS (Include Zip Code) (Address to which NRC correspondence, notices, bulletins, etc., should be sent.) P.O. Box 206 649 Fairfield, Illinois 62837		5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED (Include Zip Code) 1925 Maple Ave. Mattoon, Illinois 61938			
(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)					
6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL (See Items 16 and 17 for required training and experience of each individual named below)					
FULL NAME		TITLE			
a. Carl W Hubbartt		President & General Manager			
b.		Applicant <i>Carl W. Hubbartt</i>			
c.		Check No. <i>529</i>			
7. RADIATION PROTECTION OFFICER Carl W Hubbartt		Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15. Type of fee <i>App'l fee</i>			
8. LICENSED MATERIAL					
L I N E NO.	ELEMENT AND MASS NUMBER	CHEMICAL AND/OR PHYSICAL FORM	NAME OF MANUFACTURER Received BY AND MODEL NUMBER (If Sealed Source)	MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTI- VITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME	
	A	B	C	D	
(1)	Americium 241	Sealed Source	Gulf Nuclear, Inc. <i>GNC-3 - model</i>	Not to exceed 5 curies/source	
(2)	Cesium 137	Sealed Source	Gulf Nuclear, Inc. <i>GNC-3 - model</i>	Not to exceed 2 curies/source	
(3)	Iodine 131	any	Gulf Nuclear, Inc. <i>GNC-3</i>	25 millicuries	
(4)	Iridium 192	any	Gulf Nuclear, Inc.	25 millicuries	
DESCRIBE USE OF LICENSED MATERIAL E					
(1)	Lines # 1&2 to be used for Oil well logging services				
(2)					
(3)	Lines # 3&4 to be used for tracer studies in oil & Gas Wells.				
(4)					

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9. STORAGE OF SEALED SOURCES

LINE NO.	CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED. A.	NAME OF MANUFACTURER B.	MODEL NUMBER C.
(1)	Gearhart 3&5 Curie Neutron Shield	Gulf Nuclear & Gearhart Industries	#GNG3 3&5 Curie Shield
(2)	Lead shield		
(3)			
(4)			

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	TYPE OF INSTRUMENT A	MANUFACTURER'S NAME B	MODEL NUMBER C	NUMBER AVAILABLE D	RADIATION DETECTED (alpha, beta, gamma, neutron) E	SENSITIVITY RANGE (milliroentgens/hour or counts/minute) F
(1)	Survey Meter	Victoreen	493	2	Gamma-Neutron	0-300 C/M
(2)	Film Badge	Gulf Nuclear		all employees	GR/Neutron	
(3)	leak test	Gulf Nuclear	LTK-1	all sources	GR/N	
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☒ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

Gulf Nuclear, INC.

100 NASA RD. Suite#1

Webster, Texas 77598 every 6 mos.

☐ b. CALIBRATED BY APPLICANT

Attach a separate sheet describing method, frequency and standards used for calibrating instruments.

12. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate.) A	SUPPLIER (Service Company) B	EXCHANGE FREQUENCY C
<input checked="" type="checkbox"/> (1) FILM BADGE	Gulf Nuclear, Inc. 202 Medical Center Blvd. Webster, Texas 77598	<input checked="" type="checkbox"/> MONTHLY
<input type="checkbox"/> (2) THERMOLUMINESCENCE DOSIMETER (TLD)		<input type="checkbox"/> QUARTERLY
<input type="checkbox"/> (3) OTHER (Specify): _____		<input type="checkbox"/> OTHER (Specify): _____

13. FACILITIES AND EQUIPMENT (Check where appropriate and attach annotated sketch(es) and description(s).)

- ☐ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS (Include filtration, if any), ETC.
- ☒ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING (fixed and/or temporary), ETC.
- ☒ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.
- ☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

Gulf Nuclear INC. WEBSTER, TEXAS

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

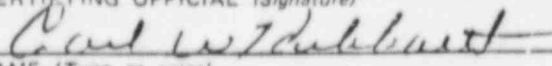
15. RADIATION PROTECTION PROGRAM. Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures (if needed), day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.
16. FORMAL TRAINING IN RADIATION SAFETY. Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.
 - a. Principles and practices of radiation protection.
 - b. Radioactivity measurement standardization and monitoring techniques and instruments.
 - c. Mathematics and calculations basic to the use and measurement of radioactivity.
 - d. Biological effects of radiation.
17. EXPERIENCE. Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 30, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

WARNING.—18 U.S.C., Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

a. LICENSE FEE REQUIRED (See Section 170.31, 10 CFR 170)	b. CERTIFYING OFFICIAL (Signature)  c. NAME (Type or print) Carl W Hubbartt
(1) LICENSE FEE CATEGORY: Well Logging & Survey	d. TITLE General Manager & President
(2) LICENSE FEE ENCLOSED: \$ NEW 460.00	e. DATE March 23, 1984

Resume of applicant

Name Carl W Hubbartt
Address P.O.Box 734
Fairfield, Illinois 62837
Birth Date April 14,1955
Occupation Oil Well Logging Engineer

Formal training in Radiation Safety

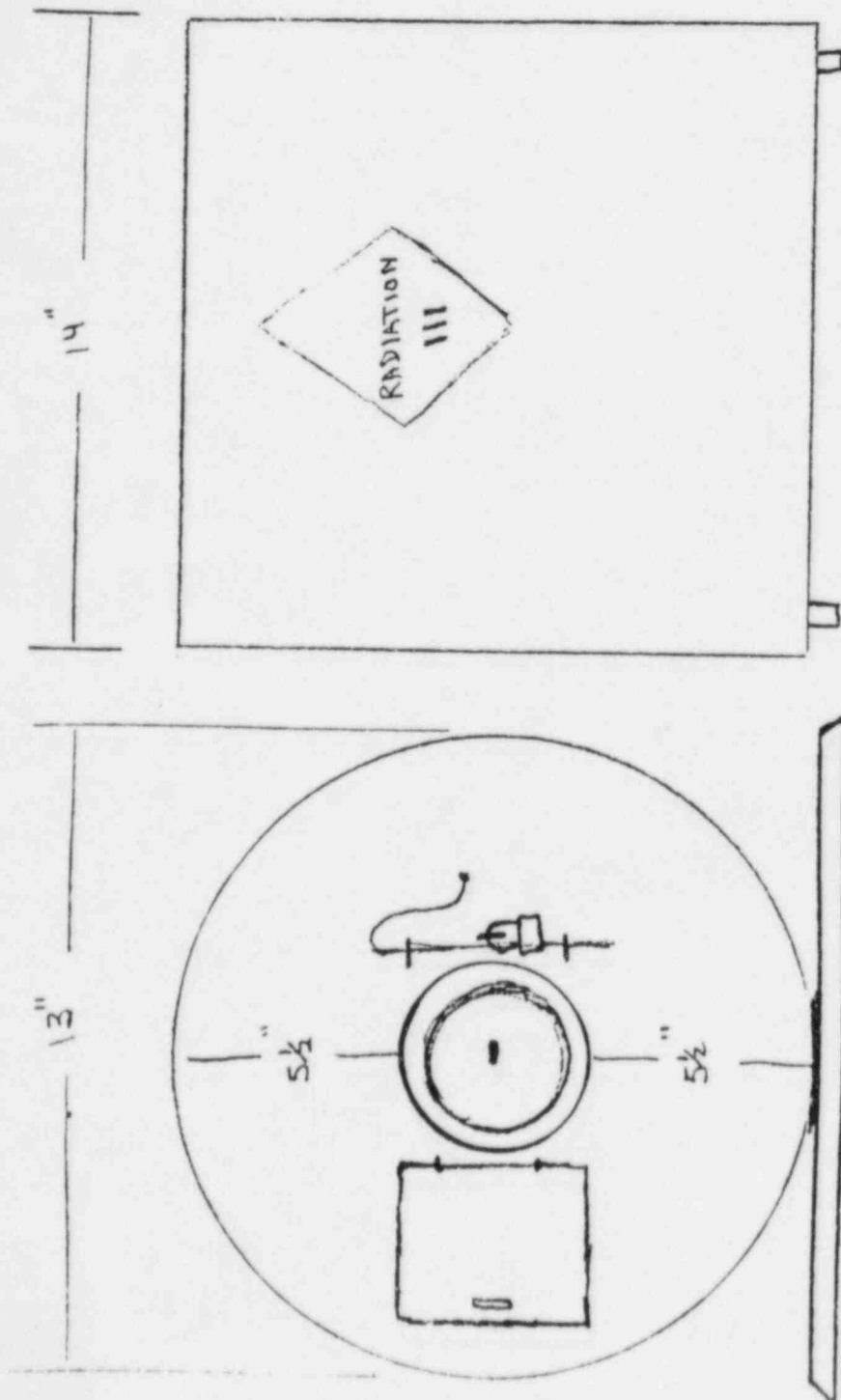
I have attended the three day Oil well radiation training school provided by Gulf Nuclear,Inc.,completed March 24, 1982.My Certificate is attached. After such training I have been involved as general manager & Radiation Safety Officer at Mid-States Logging & Perforating Co. in Fairfield,Ill., for the past 2 years.

I am familiar with items a,b,c,d, under Item 16 of the Radiation application form 313. These items were discussed and covered during my schooling in Radiation with Gulf Nuclear, Inc.

Item # 15 I have outlined in my Radiation Manual, appendix A,RADIATION PROGRAM MANAGEMENT AND RESPONSIBILITY,which I Have initiated as my new companys daily procedures.

EXPIRENC- ITEM 17 of application

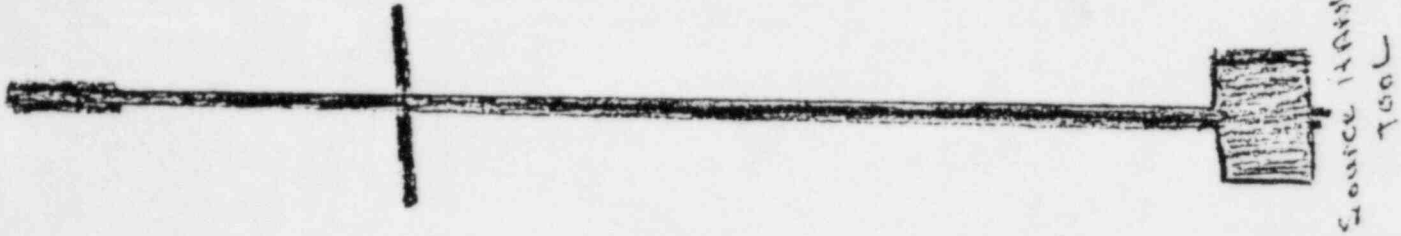
My experience includes the use of the following radio-isotopes; Americium 241,3 & 5 curie Neutron sealed sources,2 curie Cesium 137 sealed source, & Liquid Iodine 131,& Iridium 192, for the purpose of Oil Well Logging & Tracer studies with my company. These radioisotopes are the same isotopes I plan to use under my one truck logging company in the near future.



Side View

Front View

MODEL GNG3
Geostart Lead Source Shield



Revised Addition for Materials License
United Wireline Services Inc.

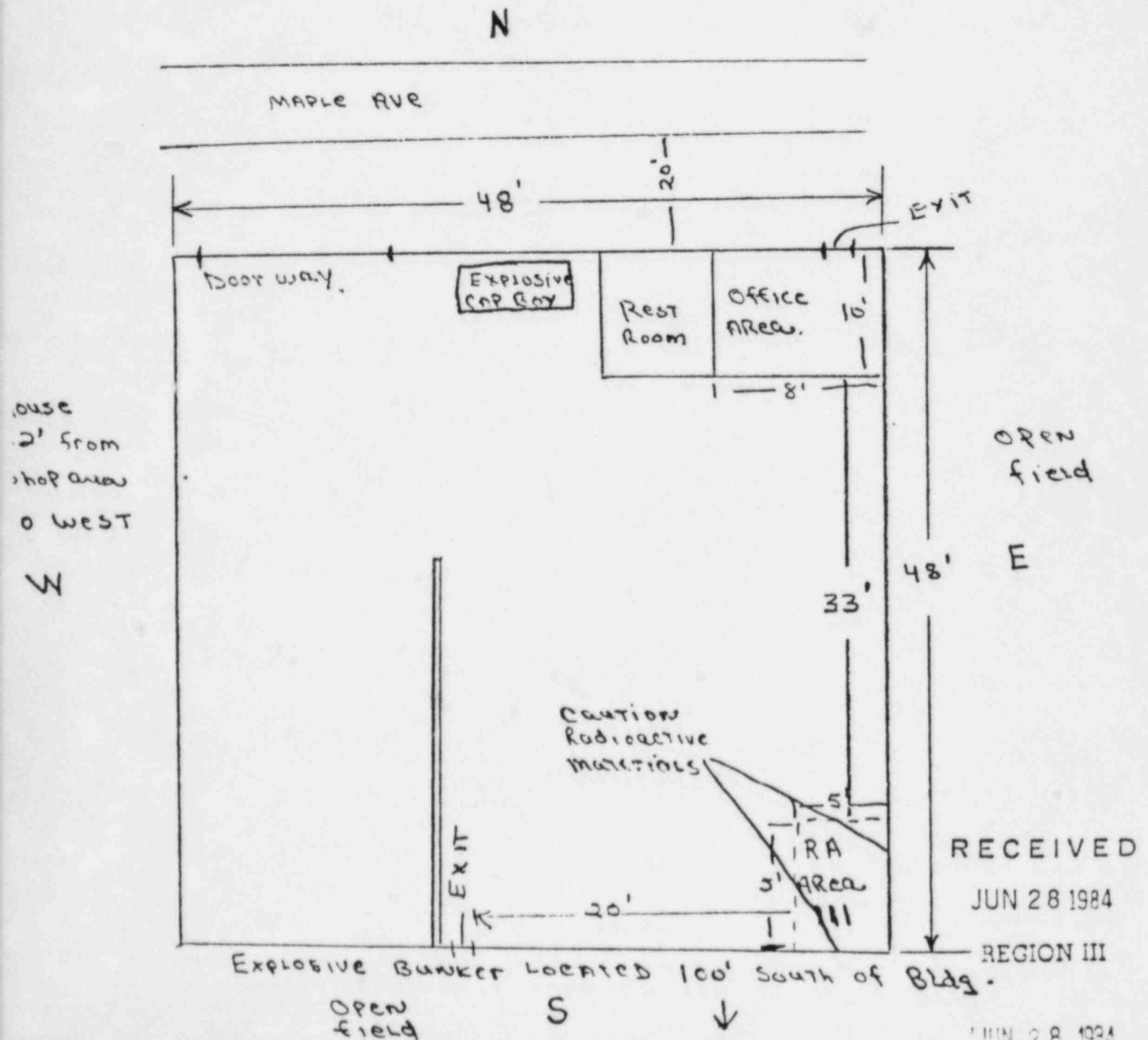
Submitted by Carl W. Hubbartt

1. Item #5 of application

Street address the same.

Licensed material will be used at any remote area or temporary job sites within the complying NRC states in the U.S. for Logging purposes only.

Description of shop area is as follows, including designated storage area.



The surveillance of all RA materials will be handled by myself at all times during the use of the material at temporary job sites, as well as in the shops and transporting to and from the job sites.

All incoming and out going source shipments to and from the supplier will be scheduled and handled by myself at my convenience, so that I may monitor excess RA levels, check into or out of inventory, the proper paper work is in order, etc.

Under Item 8 of application the following;

Model numbers will be used

AmBe source 241	71-1	not to exceed 5 curies
Cesium source 137	CSV	not to exceed 2 curies

I will assure they will not be altered in any way, nor will the Radioactive pill be tampered with or removed, while in my possession as the designated uses of such source.

All sealed sources will remain in their respective shields under lock and key while not in use, either in the shop designed area or on the truck during transporting.

A routine inspection of all RA material containers and equipment will be performed on a monthly basis to assure proper conditions such as condition of source, proper labeling, workable source handling tools, etc. any equipment found defective will be replaced immediately. And records of such inspection maintained for a period of at least 2 years.

Fishing operations

All fishing operations will at all times be under my supervision, a junk basket or an overshot will be used to fish for the source if deemed feasible.

The following procedure will be used;

- A. Clear area of all unauthorized personnel and post restricted area
- B. Make a RA survey of the well and surrounding area.
- C. Notify the NRC and local authorities
- D. Proceed with fishing operations if possible
- E. If attempts are unsuccessful, the source will be cemented in permanently, including a deflection device.
- F. Identification plaque placed at the well head, with the information as outlined in section D page 28 of NRC well logging operations.
- G. File report with NRC containing information in section C, item 3 page 27

of NRC well logging operations.

D.O.T. Regulations

At all times all employees will follow D.O.T. regulations, as they will keep Regulation Log books, survey sheets, the proper plackarding, etc.

Utilization Records

I will agree to maintain current records which will be kept available for a period of 2 years containing information as,

- A. Make, model, and serial number of each source used and dates.
- B. The identity of well logged or supervising user assigned.
- C. Locations where used and dates
- D. Tracer materials will include the radionuclide and activity used in each well.

Documents and Records at field stations;

I will agree to maintain for inspection by the NRC the following documents and records.

- A. Copy of the NRC license
- B. Operating and emergency procedures manual
- C. Applicable regulations
- D. Record of latest survey instrument calibrations
- E. Record of leak test results
- F. Inventories required in accordance with item 10.2.6.
- G. Utilization records required in item 10.2.7.
- H. Records of inspection and maintenance required in item 10.2.9.
- I. Survey records required in accordance with item 10.5.1.

Documents and records at temporary job sites

I will agree that while conducting operations at a temporary job site, the following records will be made available for inspection;

- A. Operating and emergency procedures manual
- B. Survey records in accordance with item 10.5.1 of application.

- C. Evidence of current calibration for the survey instruments in use at site.
- D. When operating in an agreement state under reciprocity, a copy of my NRC liscence.

Facilities and Equipment

We will be using 3 survey meters with a scale of 0-100 MR/H, which will be sent to Gulf Nuclear every 6 months for calibration. The survey meter calibration will be spaced 3 months apart so there will be at least 2 meters available at all times, one in the shop area, and one for job site and truck use. Survey Meter used-Victoreen

492
measures Neutron-Gamma
C-1 R

Personnel Monitoring

All personnel directly related to activity involving radioactive materials will wear a TLD badge or a suitable acceptable dosimeter. Film badge records will be quarterly and monitoring will be at least on a quarterly basis.

Leak Procedures

Leak tests will be performed every 6 months by Radiation safety officer, myself. I will be using the LTK-1 leak test kit supplied by Gulf Nuclear. The source will be swab tested, using the source handling tool to minimize exposure time during the test. Once the test is completed, a survey of the leak test kit will be made before sending the test to Gulf Nuclear for analysis, the readings will also be recorded for our files the same day.

I myself will be the only classified user of RA materials at the time. I intend to initiate 2 types of training programs as follows.

A. Program 1 will be designed to familiarize the hazards of radiation, its, affects, the use of the film badges, survey meters, etc. This program will be directed to non users associated with the company such as sales personnel and servicemen under my supervision at all times.

- (
- B. Program 2 will be directed to potential users as engineers who will be required to attend at least 24 hours of instructions in well logging safety through a qualified institution such as Gulf Nuclear to be certified. (section 10.3.1 of instruction manual)

All employees classified as users or non users will be required to take an annual refresher course on a regular basis either written or orally.

Individuals responsible for safety program;

I agree to follow the items under item 7, page 5 and 6 of RA logging guidelines, under my position of Radiation protection officer, especially items d,e,g,h,.

- D. To ensure that liscenced material is properly secured against unauthorized removal at all times.
- E. To supervise leak testing of sealed sources and instrument calibration
- G. To serve as a point of contact and give assistance in case of emergency.
- H. To ensure that the terms and conditions of the liscence such as periodic leak tests, are met and that the required records such as personel exposure records, leak test records, etc. are periodically reviewed for compliance with NRC regulations and the liscence conditions as listed on the liscence.

A temporary shop facility will be set up in Industrial Park located in Fairfield Illinois to also house our Ra and explosives materials until our permanent office is completed in Whittington, Illinois on Route 37 south of Mt. Vernon Illinois approximately 12 miles south. This will then be our only permanent shop and office NOW under construction. We will purchase only 1 AmBe 241 sealed source at this time until our permanent shop facility or the Fairfield facility, so I anticipate no problems in the monitoring of this source. I have enclosed a diagram of the temporary facility in Fairfield as well.

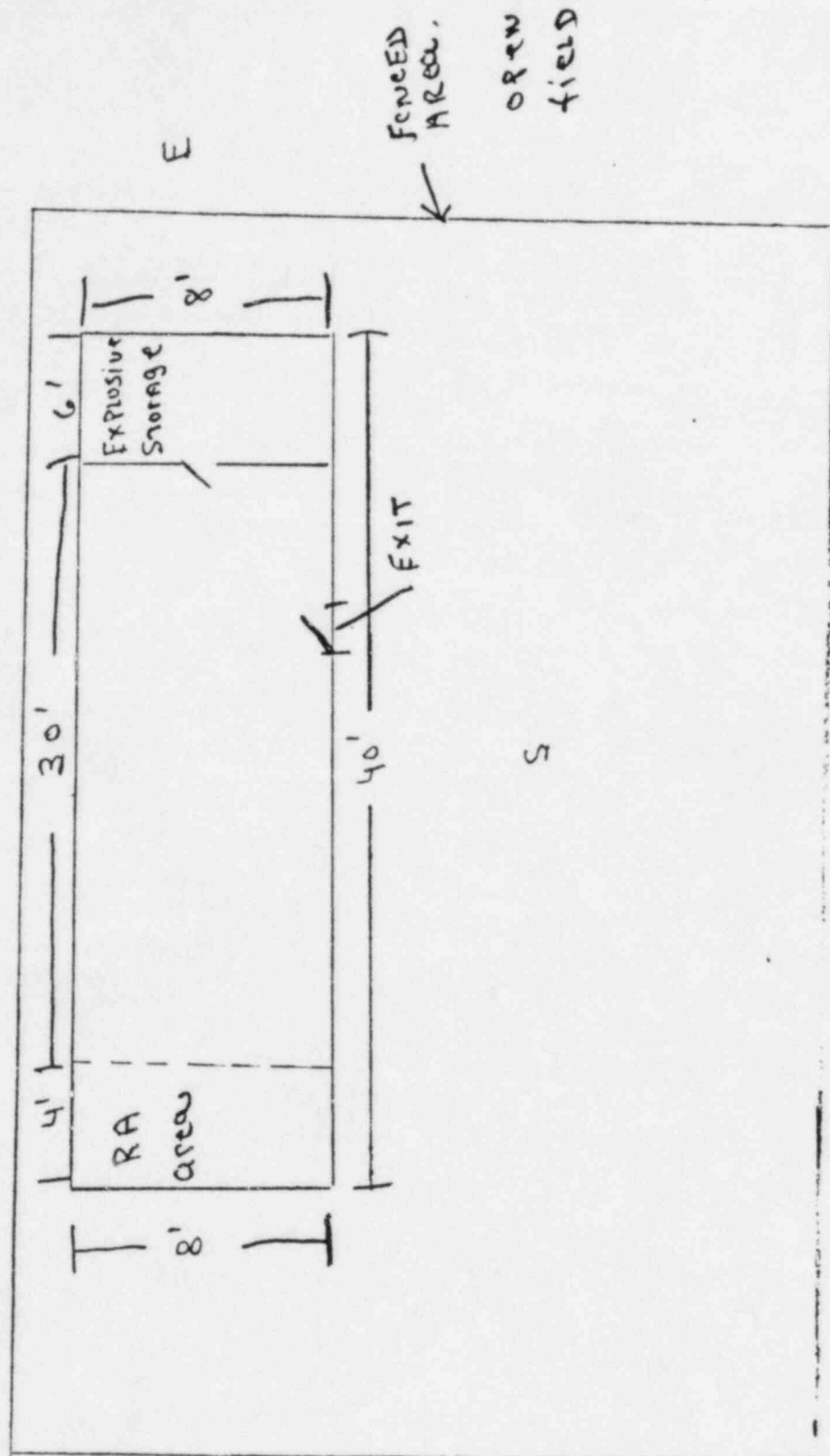
Respectfully submitted,

Carl W. Hubbart

Carl W. Hubbart

Open field

N



FENCED AREA
Open field

Open field

Nearest Bldg 100 yards

Communal area

Outside City limits

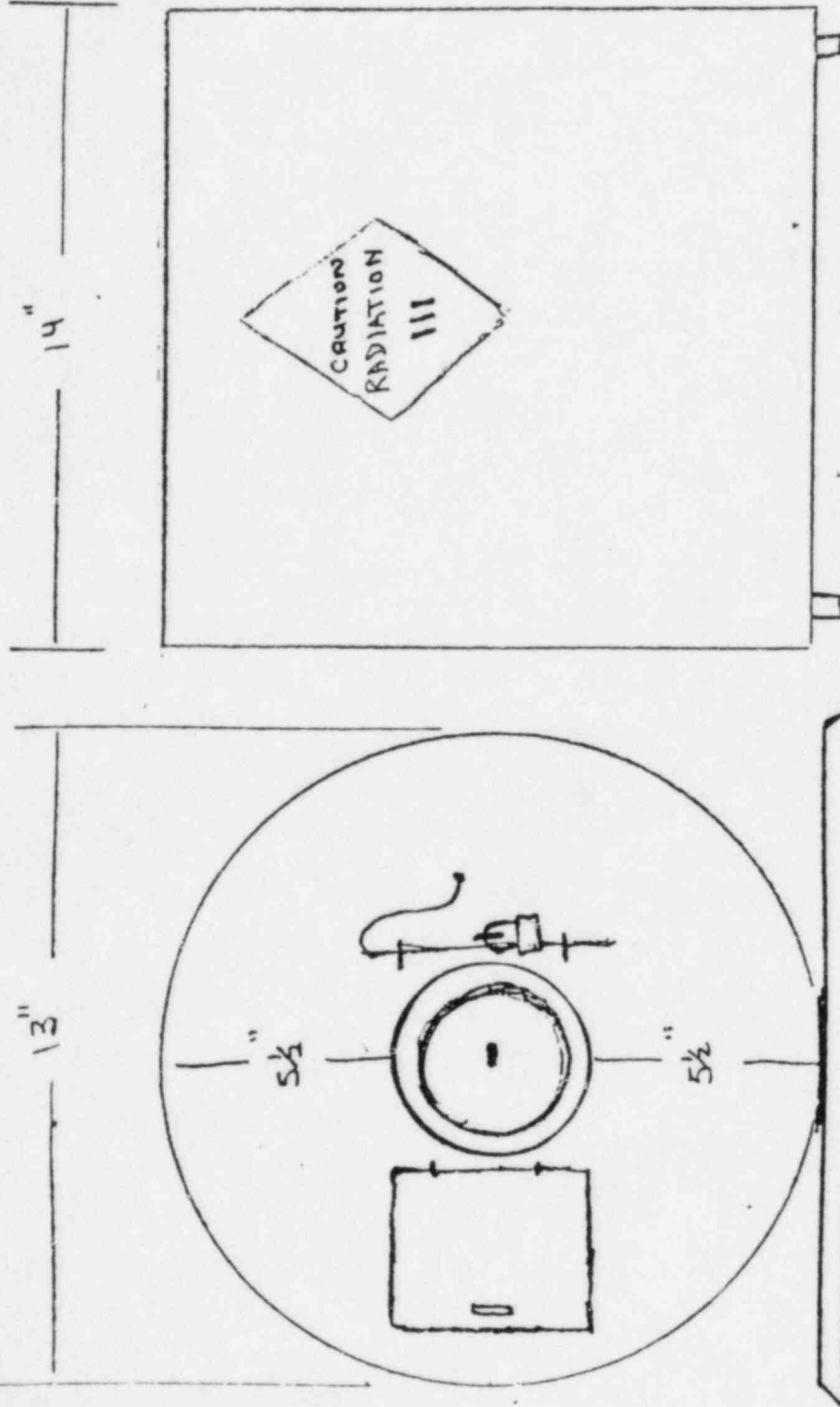
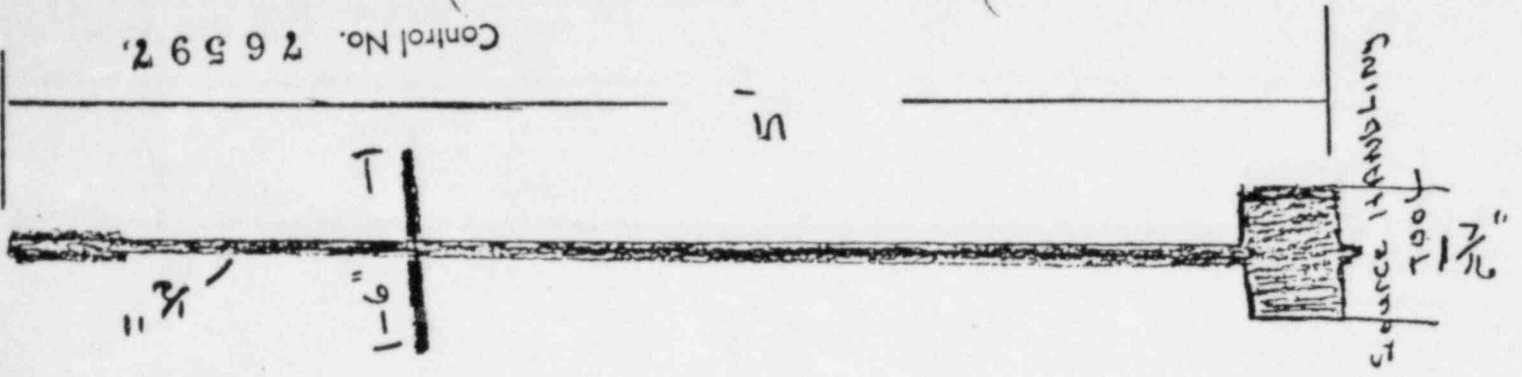
Fairfield Location

INDUSTRIAL PARK

Open field

Open field

Control No. 26592



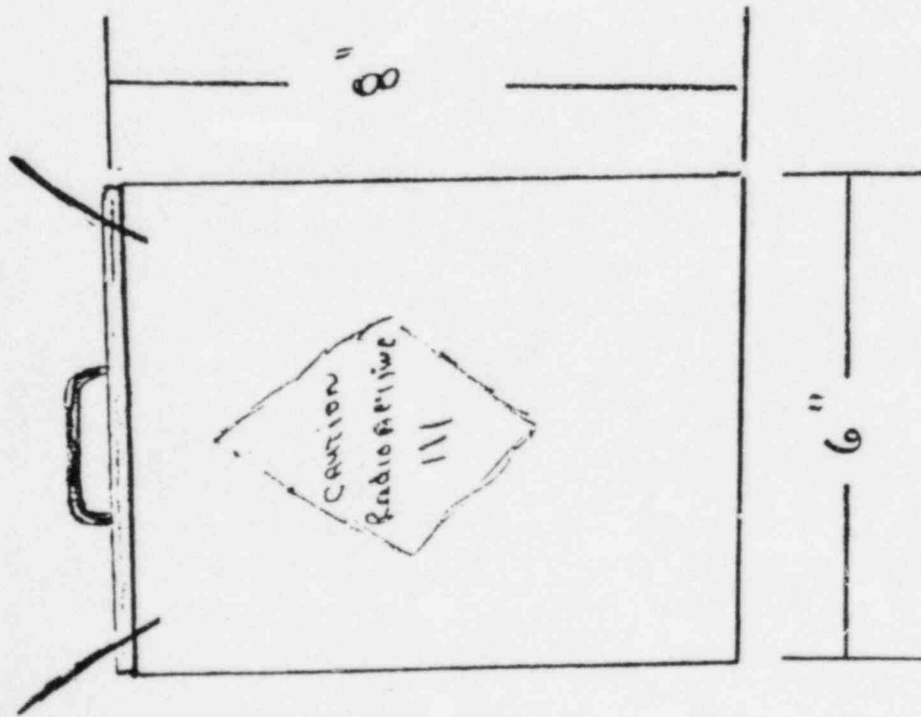
Side view

Front view

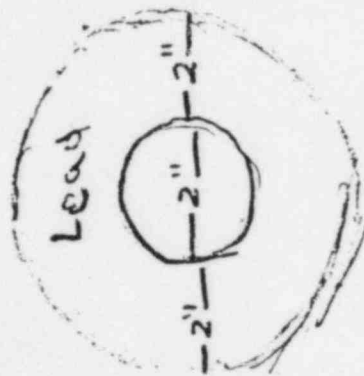
MODEL GNG3

Gearhart Lead Source Shield

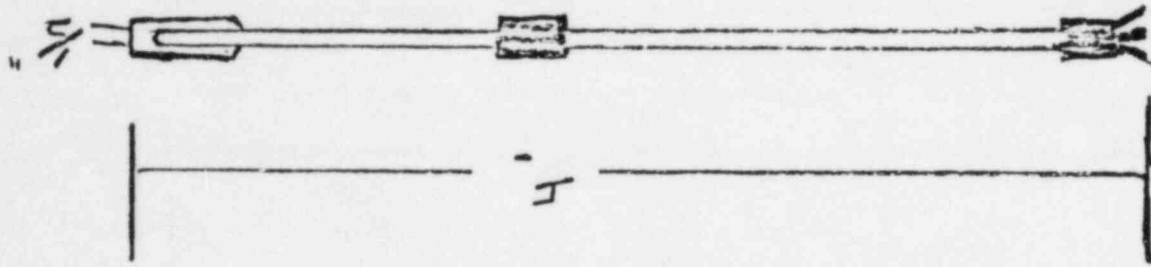
Ambe 241 71-1



Side View
Model GC2



TOP VIEW
OF P19



Source Model # CSV 200

APPLICATION FOR BYPRODUCT MATERIAL LICENSE
INDUSTRIAL

1. APPLICATION FOR:
(Check and/or complete as appropriate)

XX a. NEW LICENSE

b. AMENDMENT TO:
LICENSE NUMBER

c. RENEWAL OF:
LICENSE NUMBER

See attached instructions for details.

Completed applications are filed in duplicate with the Division of Fuel Cycle and Material Safety, Office of Nuclear Material Safety, and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555 or applications may be filed in person at the Commission's office at 1717 H Street, NW, Washington, D. C. or 7915 Eastern Avenue, Silver Spring, Maryland.

2. APPLICANT'S NAME (Institution, firm, person, etc.)

UNITED WIRELINE SERVICE, INC.

TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION
618-842-7838

3. NAME AND TITLE OF PERSON TO BE CONTACTED
REGARDING THIS APPLICATION

CARL W HUBBARTT, PRES. & MANAGER

TELEPHONE NUMBER: AREA CODE - NUMBER EXTENSION
842-7838

4. APPLICANT'S MAILING ADDRESS (Include Zip Code)
(Address to which NRC correspondence, notices, bulletins, etc., should be sent.)

P.O. Box ~~254~~ 649
Fairfield, Illinois 62837

5. STREET ADDRESS WHERE LICENSED MATERIAL WILL BE USED
(Include Zip Code)

1925 Maple Ave.
Mattoon, Illinois 61938

(IF MORE SPACE IS NEEDED FOR ANY ITEM, USE ADDITIONAL PROPERLY KEYED PAGES.)

6. INDIVIDUAL(S) WHO WILL USE OR DIRECTLY SUPERVISE THE USE OF LICENSED MATERIAL
(See Items 16 and 17 for required training and experience of each individual named below)

FULL NAME	TITLE
a. Carl W Hubbartt	President & General Manager
b.	
c.	

7. RADIATION PROTECTION OFFICER
Carl W Hubbartt

Attach a resume of person's training and experience as outlined in Items 16 and 17 and describe his responsibilities under Item 15.

8. LICENSED MATERIAL

LINE NO.	ELEMENT AND MASS NUMBER	CHEMICAL AND/OR PHYSICAL FORM	NAME OF MANUFACTURER AND MODEL NUMBER (If Sealed Source)	MAXIMUM NUMBER OF MILLICURIES AND/OR SEALED SOURCES AND MAXIMUM ACTIVITY PER SOURCE WHICH WILL BE POSSESSED AT ANY ONE TIME
A	B	C	D	
(1)	Americium 241	Sealed Source	Gulf Nuclear, Inc. 71-1 GNC3 - model	Not to exceed 5 curies/source
(2)	Cesium 137	Sealed Source	Gulf Nuclear, Inc. C5V GNC3 - model	Not to exceed 2 curies/source
(3)	Iodine 131	any	Gulf Nuclear, Inc. C5V	25 millicuries
(4)	Iridium 192	any	Gulf Nuclear, Inc. C5V	25 millicuries

DESCRIBE USE OF LICENSED MATERIAL
E

- (1) Lines # 1&2 to be used for Oil well logging services
- (2)
- (3) Lines # 3&4 to be used for tracer studies in oil & Gas Wells.
- (4)

9. STORAGE OF SEALED SOURCE

LINE NO.	CONTAINER AND/OR DEVICE IN WHICH EACH SEALED SOURCE WILL BE STORED OR USED. A.	NAME OF MANUFACTURER B.	MODEL NUMBER C.
(1)	Gearhart 3&5 Curie Neutron Shield	Gulf Nuclear & Gearhart Industries	#GNG3 3&5 Curie Shield
(2)	Lead shield		
(3)			
(4)			

10. RADIATION DETECTION INSTRUMENTS

LINE NO.	TYPE OF INSTRUMENT A	MANUFACTURER'S NAME B	MODEL NUMBER C	NUMBER AVAILABLE D	RADIATION DETECTED (alpha, beta, gamma, neutron) E	SENSITIVITY RANGE (milliroentgens/hour or counts/minute) F
(1)	Survey Meter	Victoreen	492	3	Gamma-Neutron	0-300 CPM 0-1 R
(2)	Edm TLD Badge	Gulf Nuclear		all employees	GR/Neutron	
(3)	leak test	Gulf Nuclear	LTK-1	all sources	GR/N	
(4)						

11. CALIBRATION OF INSTRUMENTS LISTED IN ITEM 10

☒ a. CALIBRATED BY SERVICE COMPANY

NAME, ADDRESS, AND FREQUENCY

Gulf Nuclear, INC.

100 NASA RD. Suite #1

Webster, Texas 77598 every 6 mos.

☐ b. CALIBRATED BY APPLICANT

Attach a separate sheet describing method, frequency and standards used for calibrating instruments.

12. PERSONNEL MONITORING DEVICES

TYPE (Check and/or complete as appropriate.) A	SUPPLIER (Service Company) B	EXCHANGE FREQUENCY C
<input checked="" type="checkbox"/> (1) FILM BADGE	Gulf Nuclear, Inc. 202 Medical Center Blvd. Webster, Texas 77598	<input checked="" type="checkbox"/> MONTHLY
<input type="checkbox"/> (2) THERMOLUMINESCENCE DOSIMETER (TLD)		<input type="checkbox"/> QUARTERLY
<input type="checkbox"/> (3) OTHER (Specify): _____		<input type="checkbox"/> OTHER (Specify): _____

13. FACILITIES AND EQUIPMENT (Check where appropriate and attach annotated sketch(es) and description(s).)

☐ a. LABORATORY FACILITIES, PLANT FACILITIES, FUME HOODS (Include filtration, if any), ETC.☒ b. STORAGE FACILITIES, CONTAINERS, SPECIAL SHIELDING (fixed and/or temporary), ETC.☒ c. REMOTE HANDLING TOOLS OR EQUIPMENT, ETC.☐ d. RESPIRATORY PROTECTIVE EQUIPMENT, ETC.

14. WASTE DISPOSAL

a. NAME OF COMMERCIAL WASTE DISPOSAL SERVICE EMPLOYED

Gulf Nuclear INC. WEBSTER, TEXAS

b. IF COMMERCIAL WASTE DISPOSAL SERVICE IS NOT EMPLOYED, SUBMIT A DETAILED DESCRIPTION OF METHODS WHICH WILL BE USED FOR DISPOSING OF RADIOACTIVE WASTES AND ESTIMATES OF THE TYPE AND AMOUNT OF ACTIVITY INVOLVED. IF THE APPLICATION IS FOR SEALED SOURCES AND DEVICES AND THEY WILL BE RETURNED TO THE MANUFACTURER, SO STATE.

INFORMATION REQUIRED FOR ITEMS 15, 16 AND 17

Describe in detail the information required for Items 15, 16 and 17. Begin each item on a separate page and key to the application as follows:

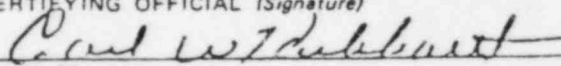
15. **RADIATION PROTECTION PROGRAM.** Describe the radiation protection program as appropriate for the material to be used including the duties and responsibilities of the Radiation Protection Officer, control measures, bioassay procedures (if needed), day-to-day general safety instruction to be followed, etc. If the application is for sealed source's also submit leak testing procedures, or if leak testing will be performed using a leak test kit, specify manufacturer and model number of the leak test kit.
16. **FORMAL TRAINING IN RADIATION SAFETY.** Attach a resume for each individual named in Items 6 and 7. Describe individual's formal training in the following areas where applicable. Include the name of person or institution providing the training, duration of training, when training was received, etc.
 - a. Principles and practices of radiation protection.
 - b. Radioactivity measurement standardization and monitoring techniques and instruments.
 - c. Mathematics and calculations basic to the use and measurement of radioactivity.
 - d. Biological effects of radiation.
17. **EXPERIENCE.** Attach a resume for each individual named in Items 6 and 7. Describe individual's work experience with radiation, including where experience was obtained. Work experience or on-the-job training should be commensurate with the proposed use. Include list of radioisotopes and maximum activity of each used.

18. CERTIFICATE

(This item must be completed by applicant)

The applicant and any official executing this certificate on behalf of the applicant named in Item 2, certify that this application is prepared in conformity with Title 10, Code of Federal Regulations, Part 30, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

WARNING.—18 U.S.C., Section 1001; Act of June 25, 1948; 62 Stat. 749; makes it a criminal offense to make a willfully false statement or representation to any department or agency of the United States as to any matter within its jurisdiction.

a. LICENSE FEE REQUIRED (See Section 170.31, 10 CFR 170) 460 ^{SE}	b. CERTIFYING OFFICIAL (Signature)  c. NAME (Type or print) Carl W Hubbartt
(1) LICENSE FEE CATEGORY: Well Logging & Survey	d. TITLE General Manager & President
(2) LICENSE FEE ENCLOSED: \$ NEW 460.00	e. DATE March 23, 1984

UNITED
WIRELINE SERVICES, INCORPORATED

RADIOACTIVE MATERIALS
STORAGE, OPERATING AND EMERGENCY PROCEDURES MANUAL

APPENDIX A

- I. Radiation Program Management and Responsibility
 - A. Company Organization Chart
- II. Radiation Safety Officer
- III. Personnel Monitoring Procedures
- IV. Storing and Securing Radioactive Materials
- V. Posting Requirements
- VI. Records Management
- VII. Procedures for Transporting Radioactive Materials

APPENDIX A

I. RADIATION PROGRAM MANAGEMENT AND RESPONSIBILITY;

- a. The radiation Protection Officer is to be designated overall manager for the radiation program.
- b. The duties of the Radiation Protection Officer included the delegation of authority to persons responsible for carrying out the duties such as that of Radiation Safety Officer, Overall responsibility for records, surveys, the forming of committees where necessary and in general the administrative procedures for the entire radiation program. The Radiation Protection Officer is CARL W HUBBARTT.

II. The Radiation Safety Officer is responsible to the Radiation Protection Officer and in general is to conduct or cause to be conducted the programs and responsibility delegated by the Radiation Protection Officer. These duties might include;

- a. Site surveys
- b. Records, personnel monitoring records and compilation
- c. Vehicle survey records
- d. Training & qualifying personnel
- e. Conducts periodic safety checks to assure the radiation protection program.

The Radiation Safety Officer is CARL W HUBBARTT.

III. PERSONNEL MONITORING PROCEDURES

ALL personnel directly related to activity involving radioactive materials will wear a film badge or a suitable acceptable dosimeter. Film badge records will be quarterly and monitoring will be at least on a quarterly basis.

It is clearly understood that maximum acceptable dose levels are not to exceed 1.25 Rem per calendar quarter or no more than 5.0 Rem per calendar year.

It is also clearly understood that in the event these doses are greater than those listed above that proper notification will be posted with the licensing authority. Also reports of dosages will be maintained on at least a quarterly basis.

IV. Storing and Securing Radioactive Materials

Upon receipt of the radioactive materials the receiving records will be placed in a properly marked file. The materials will be placed in a secure area that is properly marked with appropriate signs around the perimeter. This area will be either a room, a storage area or a storage bunker but will in any case contain a door or lock type top. Materials when not in use will remain in the storage area properly locked and secured.

V. Posting Restricted Area, Vehicles and Labelling Containers

- a. Posting restricted areas-Storage area and areas where radiation levels are expected to achieve 2 mR/hr will be labelled with signs stating "Caution-Radiation Area" or "Caution Radioactive Materials". These signs will bear the radiation symbol and be magenta and safety yellow in color. The signs will be conspicuous and obvious from all directions. In the event that the levels exceed 5 mR/hr then a sign stating "Caution High Radiation Area", magenta and safety yellow in color will be conspicuously posted.

A proper Notice to Employees will also be posted where it is obvious to employees.

- b. Vehicle Placarding. All vehicles transporting or containing radioactive materials will bear a placard on four sides that bears the proper labelling according to the D.O.T. specifications the word "RADIOACTIVE". This placard approximately 10 3/4" x 10 3/4" will be placed on the vehicle only when the vehicle is transporting or storing radioactive materials.

The placard is black lettering on a safety yellow background. It is clearly understood that this placard will not be displayed if the vehicle is not carrying radioactive materials.

- c. All containers carrying or storing or used for transporting radioactive materials will bear a tag with the identification of the radioactive material, the quantity of the radioactive materials and the date that the radioactive material was that particular quantity. The tag will also state "Caution-Radioactive Materials."

VI. Records Management

- a. Utilization Log-This log will contain the master file on each type or shipment of radioactive material received and the distribution of each such shipment. This master file will be maintained at the facility.
- b. Receipt and transfer records will be maintained in files to show at all times where material is to be located or if it is disposed of.
- c. Personnel exposure records-film badge, TLD or dosimeter reports-will be maintained in a separate file along with proper quarterly reports on each person using radioactive materials.
- d. Leak Test records on all sealed sources will be maintained on each sealed source. These records will indicate leak testing at six month intervals.
- e. Survey records which include building or storage areas surveys on a quarterly basis will be maintained in a file. These surveys will reflect in milliroentgens readings at a point on each side and the top of the storage area.
- f. Vehicle surveys will be conducted at monthly intervals and these surveys will be maintained in a file.
- g. Surveys will be conducted by monitoring a well bore at the surface prior to use of any radioactive material and remonitoring the well bore upon completion of the work. These numbers will be recorded. A survey meter or tool which is acceptable will be used for the monitoring process. Records of this survey performed on each job will be maintained in a file.

VII. Procedures for Transporting Radioactive Materials

- a. Radioactive Materials may be transported by company vehicle or private vehicle provided the vehicle is properly labeled and the material transported is pro-

perly packaged and marked. An identification will be on each container transported and the vehicle will be placarded with the proper D.O.T. markings.

- b. The vehicle transporting radioactive materials will be clearly placarded with a 10 3/4" x 10 3/4", diamond shaped sign with black letters that read "RADIO-ACTIVE".
- c. Packages transported will be packaged as received from the supplier. These packages generally bear a diamond shaped Yellow III label.

It is clearly understood that signs will be removed when vehicle does not transport radioactive materials.

((

APPENDIX B

- I. Procedures for Storage
 - a. Storage
 - b. Transport
- II. Procedures for Use of Radioactive Sources
- III. Radiation Surveys
- IV. Leak Test Procedures
- V. Procedures for Lost Source Driveway
- VI. Emergency Procedures
- VII. Safety Curve for AmBe Sources

APPENDIX B

I. Procedures for Storing Sealed Sources of Radioactive Materials

a. Storage

Radioactive sources must be locked in their shield and kept in a locked storage, truck compartment, cabinet, pit or chained and locked to an integral part of the truck when not in use.

Storage facilities must be designed or positioned so that no person in an uncontrolled area can receive more than 2 mR in any one hour or more than 100 mR in any seven consecutive days.

(1) Storage Pits (Downhole)

- (a) Minimum of two feet of earth, concrete or fill separate adjacent pits.
- (b) Pits to be a minimum of four feet deep.
- (c) Lids to be screwed on or recessed in, designed to exclude water and equipped with a locking device.

(2) Surface Storage

- (a) Steel bunker with locking device
- (b) Sources are placed inside steel box in their transport shields
- (c) Maximum reading on contact, 2 mR or less. If higher reading, a fenced perimeter will be established at the 2 mR level.

(3) Posting

All storage areas must be posted "Caution-Radioactive Materials". On surface storage bunker, the posting "Caution Radiation Area" must be on four sides and on controlling fences for the area.

All radioactive sources used will be stored in their shielded transport containers. They will be stored in a secure, locked vault and placed on a secure, locked, fenced perimeter. The vault will

be chain locked to an integral part of the vehicle. Vehicle will then be placarded with D.O.T. specification "RADIOACTIVE" signs on all four-sides.

II. Procedure for Use of Radioactive Sources

Company personnel directly in charge of logging operations utilizing radioactive sources are responsible for the health protection of all personnel associated with the sources and the general public who may be associated at all times. The above personnel (company) must personally supervise all source handling operations, transportation, storage and shipping according to the following regulations.

- (1) Company personnel who have been trained in handling sealed sources shall be the only ones who perform operations involving the sources. All customer personnel shall be required to be remote to these operations.
- (2) Only the company approved handling tools will be used.
- (3) All sources are to be transported in the approved and locked source shipping containers.
- (4) Using the remote handling tools the source is removed from the shipping or transport container. The source is attached to the logging tool and placed inside of the well. When logging operation is finished the driller will return source to surface, the logging operator will remove tool from well, utilizing remote handling tool, the source will be removed from the tool and placed back into the storage container. The time-distance factors must be used effectively when working with radioactive sources to keep exposure to a minimum. When utilizing the remote handling tools a safe distance is provided but care and practice are needed to decrease the handling exposure time.
- (5) Any sources that you are not familiar with, in handling and usage, contact the area engineer or the Radiation Safety Officer before using them in a logging job.

III. Radiation Surveys

- (1) Fit source storage bunker above storage or transport container from bunker. With portable low-level survey meter, take readings at six inches from source.

Record on Job Log Sheet. Place source in vehicle in secure position. (Locked containment) Survey vehicle on all four sides. Record on Job Log Sheet.

Arrival at well site-using low level survey meter, monitor the area before commencing job. Record on sketch of area. After job is finished remonitor area to determine there is no contamination around well site. Record on Job Log Sheet. After arriving at storage site monitor vehicle to show free of contamination.

The following handling equipment must be present and used on well sites: Gloves, handling tools, protective clothing.

IV. Leak Test Procedures

Wipe tests on all sources must be performed at intervals not exceeding six months.

Source will be wipe tested with Gulf Nuclear, Inc. Model LTK-1 Leak Test Kit. (Procedures enclosed)

Leak Test Kits will be mailed to Gulf Nuclear, Inc. at Houston, Texas for counting.

Reports will be sent back to licensee with leak test certificate.

V. Procedure for Lost Source Downhole

- (1) When a source is lost notify the well owner or his representative that a source is stuck in the well. As soon thereafter as possible hand him a drawing of the source and housing model. This will enable him to know before he starts the fishing operation the quantity, type of radioactive material and the mechanical construction of the capsule and tool involved.

Immediately notify the State Radiation Control Agency involved and the U.S. Nuclear Regulatory Commission that the source has been lost and keep them informed of the progress toward recovery of the source.

- (2) Client to be notified.

- (3) Source will be furnished to all rig personnel involved in recovery. The owner will be advised of the progress toward recovery of the source.

that these are for their protection and intended primarily for a record of trivial or no exposures to his employees.

- (4) During the critical fishing operations the mud being circulated should be monitored using gamma ray equipment with the downhole tool in the mud.
- (5) You have only time and distance factors available to reduce the radiation field and personnel exposure while the source is being fished out. Where practical everyone except the driller and enough personnel to cover the hole should remain in the area. All handling of the drilling rig equipment should be handled by the customer and actual handling of the source shall be done by the licensee.

VI. Emergency Procedures

Emergencies vary greatly in their respective hazards. These are sometimes in the form of spills, fires, explosions or vehicle wrecks which consequently result in the spread of radioactive material contamination. The National Bureau of Standards Handbook Number 48, Emergency Guides, are used as a guide for the procedures. These procedures are general and any specific emergency would certainly involve additional procedures not covered in the outline.

(1) Vehicle Wreck

In the event of an accident while transporting radioactive materials, efforts should be made to minimize the exposure of any persons. This would include roping off the area, notification of the investigating officer, and Radiation Safety Officer at the home office should be notified immediately, making sure that the area is not left unattended. This will enable the Radiation Safety Officer to notify the proper governmental agency.

(2) Fire and Other Emergencies

- (a) Notify all personnel in the area immediately
- (b) Attempt to put out all fires if a radiation hazard is not immediately present
- (c) Notify the fire department
- (d) Notify the Radiation Safety Officer

When a fire or other emergency occurs, the licensee will follow the procedures outlined in the Emergency Guide.

APPENDIX C

PROCEDURES FOR TRACER APPLICATIONS

- I. OIL FIELD TRACER APPLICATION
- II. SAFETY PRECAUTIONS
- III. Health Physics Regarding Actual Field Studies
 - A. Monitoring Job Sites
 - B. Handling Equipment
 - C. Pocket Dosimeters
 - D. FILM Badges
- VI. Tracer Packaging
- V. Handling & Field Equipment check list
- VI. Operating Procedures
- VII. EMERGENCY PROCEDURES
 - A. Emergency Procedures Report
- VIII. Monitoring Techniques for Personnel
- IX. Transportation & Disposition of Radioactive Waste
- X. Safety Procedures for Handling Radioactive Tracers
 - A. Introduction
 - B. Handling Procedures
 - C. CONTAMINATION Survey Techniques
 - D. Decontamination Procedures
- XI. CHARTS
 - A. Hand Exposure from Radioactive Tracers
 - B. Radiation Levels at 1 foot from unshielded Radioactive tracer
 - C. Radiation levels at 2 feet from unshielded radioactive tracer.

I. Oil Field Tracer Applications

Selection of the isotope depends on the study to be performed. Listed below are the critical isotopes and some injection techniques.

Iodine-131
Iridium-192

The method of injection depends on the type of equipment available and the pressure and condition of the well. The following are descriptions of applicable techniques.

- A. Liquid and gas tracers can be inserted by means of a sampling bomb. A greater pressure can be exerted beyond the bomb than that of the item being worked on and the material is pushed into the well head. Very frequently used on gas wells.
- B. Materials are placed in breakable vessels and attached to a logging device. When in the well they are exploded by use of a squib charge.
- C. The material can be poured or inserted by using a syringe directly into the well head. Used where no pressure is involved.
- D. Where sand is concerned the sand is generally blended at the slurry hopper.
- E. The sample bomb is lowered into the well end by using a turning device attached to a solenoid. The material is released into the flow.
- F. An appropriate amount of the isotope is added to an injection tool which is controlled from the truck panel board permitting limited quantities of materials to be injected.

Studies covered are as follows: acidizing operations, cement top locations, cement channel locations, casing seat channel locations, water flood directional flow, oil injection profiles, interface markers, flow-calibrations, oil slurry cement locations, gas flow-calibrations, gas channel locations behind casing, gas injection profiles, gas flooding, recovery projects, refinery and chemical plant gaseous product tracing, fracturing, mud cake determination and permeability surveys.

II. Safety Precautions

Generally, the following safety facts should be known and observed when utilizing radioactive tracer materials.

- A. Safety through Distance-Distance can be an effective safety measure from a source. Safe distances should be known for the amounts of radioactive material being handled.

Examples of exposure rates at various distances from a 100 millicurie source:

<u>Radioactive Material</u>	<u>3 Feet</u> mR	<u>6 Feet</u> mR	<u>9 Feet</u> mR
Iridium-192	61	15.25	6.8
Iodine-131	25	6.25	2.8

- B. Safety through Shielding-Certain materials are effective shields against radiation. The half-layer value is the amount of shield necessary to reduce the radiation one-half.

Half-Layer value for some common materials:

<u>Radioactive Material</u>	<u>Lead</u>	<u>Steel</u>	<u>Concrete</u>
Cobalt-60	0.48"	0.87"	5.0"
Cesium-137	0.15"	0.68"	2.1"
Iridium-192	0.19"	0.5"	1.9"

- C. Safety Through Stay Time-The safety of an individual may be gained by controlling the amount of time he is exposed to radiation. If exposure attains an unsafe limit, personnel should be rotated.

III. Health Physics Regarding Actual Field Studies

- A. Monitoring Job Site Before Initiation of Work and on Completion to assure no Contamination Left at the Well Site

1. Using a low level survey meter, and before work initiation, monitor the area. Record the observations on a sketch of the area.
2. Certify the area clean before commencing the job.

- B. Handling Equipment-The following items shall be worn at all time when handling the radioactive material while health physics problems are present:

1. Gloves*
2. Face masks**
3. Handling Tongs*
4. Protective clothing*

- C. Pocket Dosimeters can be worn by personnel who are handling the radioactive materials. If, however, personnel also carry personnel film badges, the option is present as to whether the pocket dosimeter be worn. The advantage to the pocket dosimeter is direct reading, and if the radiation level is not excessive (Generally 1 to 10 mCi. of Iodine-131 will be handled per injection), then it should be the option of the field safety officer as to whether pocket dosimeters be worn.

* These items will always be worn in handling radioactive materials, i.e., preventing the possibility of contamination of the personnel actually handling the radioactive material.

** Face masks shall be worn at all times when a gaseous radioactive material is being used in a field study. The face mask shall be a type approved by the National Bureau of Mines and should contain an excellent organic filter agent.

D. Film Badges-It will be mandatory for all personnel working in the restricted area (an area greater than 2 mR/hr) to wear a film badge.

IV. Tracer Packaging

- All packages received from the suppliers containing radioactive materials shall be monitored prior to their leaving their facilities. The dosage limits shall comply to the DOT shipping regulations which are a maximum of 200 mR/hr at the surface of a shipping container and a maximum of 10 mR/hr at a distance of one meter from the surface of the container.

V. Handling and Field Equipment Check List

The specific application will require additional radiation detection equipment than that listed below, but, generally the field equipment will consist of the following items:

- First aid kit
- Kim-Wipes (Industrial type)
- Sponges
- Large and small polyethylene storage bags for containing contaminated equipment, sponges, etc....
- Protective clothing
- Two remote handling tongs
- Masking and plastic electrical tape
- Plastic wash bottles
- Rubber gloves
- Labels for the return of radioactive waste
- Dosimeter and charger
- Film badges
- Concentrated wash solution
- Low level survey meter (0 - 50 mR/hr)

VI. Operating Procedures:

A. Pre-job knowledge and planning-the Radiological Safety Supervisor must know:

1. Types of radiation involved.
2. Intensity of radiation.
3. Relative hazard of each type of radiation.
4. What the "stay time" (maximum allowable exposure time) is.
5. What the possible contamination problems are.
6. Any internal contamination problems.
7. What industrial nuisance removable contamination will create.
8. What controls must be dictated to protect personnel.
9. Plan methods for controlling access to radiographic area.

B. Specific procedures will vary with the individual job applications. In general, the following procedures should be followed:

1. Plan the job in advance.
2. Monitor the area and measure the background radiation level.
3. Optimum mixing location should be selected. Radioactive material should be mixed with injection fluid as close to well head as possible.
4. Define the area which is prohibited to unauthorized personnel. (2 mr/hr is the maximum allowable radiation to people not wearing film badges).
5. Mix radioactive material with injection fluid with special consideration given to splashing, wind conditions, and any other outside influence which could interfere with the safe handling of the material.
6. Plastic or rubber gloves should be worn at all times while handling radioactive materials. If wind velocity is sufficient to cause blowing, goggles and respirator should be used.

7. Exposure time should be controlled. If exposure approaches the maximum permissible limit, personnel should be rotated.
8. Allow no eating, smoking, or drinking in the restricted area.
9. Following the completion of the operation, the entire area should be monitored.
10. Radioactive Contamination Inspection Data Sheet should be filled out and given to customer.

VII. Emergency Procedures

Emergencies vary greatly in their respective hazards. Sometimes these emergencies are in the form of spills, fires or explosions which consequently, result in the spread of radioactive contamination. Emergency procedures contained in the National Bureau of Standards, Handbook No. 48, are given here as a guide. It must be recognized that these procedures are general and any specific emergency would certainly involve additional procedures not specifically covered in this outline.

1. Spills involving no radiation hazard to personnel:
 - a. Notify all personnel in the area at once.
 - b. Permit only a minimum number of personnel in the vicinity of the spill.
 - c. Confine the spill immediately.
 - d. Notify the Radiation Protection Officer.
 - e. Decontaminate.
 - f. Monitor all personnel involved in the spill and cleaning.
 - g. Permit no person to resume work in the area until it has been surveyed and approved by one of the approved individual users specified on the U.S. NRC and/or Agreement State Radioactive Material License.

2. Spills involving radiation hazard to personnel:

- a. Notify all personnel not involved in the spill to vacate the area at once.
- b. If the spill is liquid and the hands are protected, right the container.
- c. If the spill is on the skin, flush thoroughly.
- d. If the spill is on the clothing, discard outer or protective clothing at once.
- e. Switch off all fans. Vacate the room.
- f. Notify the Radiation Protection Officer as soon as possible.
- g. Take immediate steps to decontaminate the personnel involved.
- h. Decontaminate the area.
- i. Permit no person to resume work in the area until a survey is made and approval of the Radiological Safety Officer is secured.
- j. Prepare a complete history of the accident, and give details in the Emergency Procedures Report.

3. Injuries to personnel involving radiation hazards:

- a. Wash minor wounds immediately under running water while spreading the edges of the gash.
- b. Call a physician, preferably one who is qualified to treat radiation injuries.
- c. Permit no person involved in a radiation injury to return to work without the approval of the attending physician.
- d. Report all radiation accidents (wounds, overexposure, ingestion, inhalation) to your supervisor.

- e. Prepare a complete history of the accident and give the details in the Emergency Procedures Report.

4. Fire and other major emergencies:

- a. Notify all personnel in the area at once.
- b. Attempt to put out all fires if radiation hazard is not immediately present.
- c. Notify the Fire Department
- d. Notify the Radiological Safety Officer.
- e. Govern the fire fighting or other emergency activity by the restrictions of the Radiological Safety Officer.
- f. Following the emergency, monitor the area and determine the emergency devices necessary for safe decontamination.
- g. Decontaminate.
- h. Permit no person to resume work without approval of the Radiological Safety Officer.
- i. Monitor all persons involved in combating the emergency.
- j. Prepare a complete history of the accident and give the details in the Emergency Procedures Report.

A. EMERGENCY PROCEDURES REPORT

1. Customer: _____

2. Customer's Supervisor: _____

3. Company Supervisor: _____

4. Cause of Emergency: _____

5. Source or Isotope: _____

6. Quantity of Isotope (curies) believed to have been spilled: _____

7. Safety precautions immediately enacted: _____

8. Were there any suspected over-exposures and if so, who: _____

1. _____

2. _____

3. _____

4. _____

9. Personnel radiation survey, for those working in the Restricted Area:

Name	Head	Face	Body	Hands	Legs	Feet
1. _____	_____	_____	_____	_____	_____	_____
2. _____	_____	_____	_____	_____	_____	_____
3. _____	_____	_____	_____	_____	_____	_____
4. _____	_____	_____	_____	_____	_____	_____
5. _____	_____	_____	_____	_____	_____	_____
6. _____	_____	_____	_____	_____	_____	_____

10. On the sketch of the job site, mark the location of the exact spill.

11. Make an isodose chart if the level of the spill is greater than 10 mr @ 1 foot.

a) one foot: _____

b) three feet: _____

c) six feet: _____

12. Check the air space for contamination: _____

13. Results of wipe tests after clean up emergency procedures are undertaken:

Position No. 1: _____ (dpm)

Position No. 2: _____ (Cpm).

Position No. 3: _____ (dpm)

14. Suggestions to future prevention of this accident:

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or printed text on the paper. A small dark speck is visible near the top left corner.

- b. An additional storage facility of suitable construction will be provided for the storage of empty containers which have contained radioactive materials, contaminated objects such as tools, rags, clothing, etc. This storage facility shall remain locked at all times. Suitable markings will be placed at the location.

3. Waste Disposal

- a. Disposal by release into sanitary sewage systems- No licensee shall discharge radioactive materials into a sanitary sewage system, unless, it is readily soluble in water and does not exceed the MPC as specified in 10 CFR or applicable State regulations.
- b. Disposal by burial-no licensee shall dispose of radioactive materials by burial without a permit obtained from the Federal or State authorities.
- c. Disposal by incineration-no licensee shall dispose of radioactive materials by means of incineration.
- d. If it becomes necessary to dispose of any radioactive material, contact Gulf Nuclear, Inc. for proper steps to be taken.

4. Markings:

- a. Symbols prescribed by this section shall use the conventional radiation caution colors (magenta or purple on yellow background). The symbol is the conventional three bladed design.
- b. Use of signs-a sign or signs bearing the radiation symbol (CAUTION-RADIOACTIVE MATERIALS) shall be used in the following instances:
- (1) Radiation Areas
 - (2) Rooms or areas where radioactive materials are stored in quantities exceeding those specified in 10 CFR or applicable State regulations.
 - (3) Containers in which radioactive material is stored.
 - (4) Vehicles transporting radioactive materials.
 - (5) Packages used for shipping.

The allowable handling time is determined as the maximum time in minutes per week that a person can work with his hands (rubber gloved) in direct contact with unshielded tracer units. The allowable handling time as indicated on Chart 1 is not additive—that is, you cannot, for example work for 18 minutes with 10 millicuries of Iridium-192 and 42 minutes with an equal amount of Iodine-131 in one week. If several hand exposures to both types of tracer materials are received during one week, the exposures must be rationed.

Example: If in one calendar week a person directly handles 20 millicuries of Iodine-131 for 3 minutes, 10 millicuries of Iridium-192 for 3 minutes and 15 millicuries of Iodine-131 for 4 minutes, these exposures are totaled as follows: From the chart the allowable handling time for 20 millicuries of Iodine-131 is 21 minutes. Hence the exposure to the hands for 20 millicuries of Iodine-131 is 3 divided by 21, or .143 or the weekly allowable handling time. Similarly, the exposure for the 10 millicuries of Iridium-192 is 3 divided by 18, or .167; and that for the 15 millicuries of Iodine-131 is 4 divided by 28, or .143. Adding these three fractions, $.143 + .167 + .143$ equals .453, or a little less than half the total allowable handling time for that particular calendar week.

WHEN THE VARIOUS EXPOSURES ADD TO A TOTAL OF MORE THAN 1.000 THE WEEKLY ALLOWABLE HANDLING TIME HAS BEEN EXCEEDED AND THE FOLLOWING WEEK'S WORK MUST BE LIMITED ACCORDINGLY.

Charts 2 and 3 indicate the radiation levels that are present for various amounts of the tracer materials at one and three feet from the unshielded tracer units.

X. Safety Procedures for Handling Radioactive Tracers

- A. Introduction-In order to give proper safety consideration to the various radioactive materials used in tracer surveys, the following information should be understood by all field users. The relatively low activity levels of the tracer units allow some latitude in handling techniques such that moderate safety precautions are sufficient.

The major safety problem is the prevention of accumulation of radioactive material in the body. The activities typically used are from 100 to 10,000 times the tolerable limit for internal accumulation. The degree of this particular hazard depends on the biological activity of the isotope, its half-life and the nature of the tracer preparation.

- B. Handling Procedures-The large variety of tracer preparation used, or available for use, is such that no fixed procedures can be specified for each tracer unit. In general though, the majority of tracers may be handled for a few minutes without the use of extension tools. Charts 1, 2 and 3 indicate the relative hazards of working with various amounts of ten tracer materials.

Chart 1 gives the allowable handling time in minutes per week for various amounts of Iodine-131, Iridium-192, Scandium-46 and Zirconium-95. This is based on actual measurements made by Nuclear Environmental Engineering, Inc., our tracer supplier and a maximum allowable radiation exposure of 5.0 rems per year or 1.25 rems per quarter (18.75 rems for extremities) as specified in the pertinent Federal and/or Agreement State regulations. We must stay within the handling times as indicated on the chart in order that we may continue to handle the unshielded tracer units without the benefit of hand type monitoring devices such as wrist film badges, finger dosimeters, etc. or remote handling devices. However, the use of the normal safety equipment such as survey meters, rubber gloves, etc. and the regular film badge is still required.

Please remember that tolerances are not meant for working levels but as maximum safe levels only, and that the objective should be to obtain a minimum exposure during tracer operations. This can be accomplished by working as rapidly, yet carefully, as possible with the tracer units and also by distributing the actual direct handling of the unshielded materials among as many qualified people as possible.

C. Contamination Survey Techniques

1. Surveying of Area and Equipment

The ideal mixing and injection operation would have no spills and leave no residue of tracer material in any of the vessels or pipes through which the tracer was injected. In practice such an ideal may not be realized, and a survey of the area is necessary so that the proper procedures may be followed to assure that no remaining contaminant can cause harm to company personnel, the customer's personnel, or the general public.

The survey meter must be used with the beta shield open to survey the entire area where mixing has been done, and the pipes and associated components through which the mix was conducted to the well, to be sure that no concentration remains that may cause harm, either by external radiation or by possible contamination of food or water supplies.

Contamination of the probe must be avoided completely. If any contact survey is made, the probe is to be protected with a sheet of paper between the object and probe. A contaminated probe can render the survey meter useless for low level measurements.

Spills should be cleaned up and, if possible, injected into the well with the main tracer unit. The area of the spill should then be surveyed with the probe approximately one inch above the surfaces.

Any areas or items of equipment which indicate any amount of detectable radioactivity, above background, shall be considered contaminated and appropriate measures taken to remove such concentrations. (See Paragraph D)

2. Surveying of Individuals

The greatest care in survey measurement is taken on items of personal equipment such as shoes, gloves, clothing and handling tools, as well as exposed portions of the body of personnel working with radioactive materials. This is because of the much greater probability of ingestion from such items.

The survey meter should also be used with the beta shield open to read the radiation level of clothing worn by the individual performing the mixing operation or any other clothes suspected of contamination. This should be done immediately following the mixing operations. If any indication of radioactive contamination is found on items of clothing, equipment, etc., or on the person of personnel involved in the operation, every effort should be made to remove the activity. (See Paragraph D for decontaminating.)

D. Decontamination Procedures

The radioactive tracer preparations are given by factors of 10 to 100 below the dangerous levels for external radiation hazards. The major hazard involved with these tracer preparations is the factor of ingestion. The ingestion tolerance is from one part per thousand to one part per ten thousand of the typical activities used. Thus, great care is exercised by company personnel to avoid contamination of hands, clothing and

other personal items. Accidental concentrations of radioactive material are cleaned up, dispersed, or disposed of safely.

Decontamination shall, in general, be accomplished by rinsing and flushing with fresh water through the equipment, or washing and scrubbing of contaminated items of clothing or portions of the individual's body. A detergent may be added to the water to aid this process. Portions of the equipment which cannot be decontaminated by this method shall be disassembled and scrubbed with water and detergent followed, if necessary, by steam cleaning. A 15% hydrochloric acid solution may be used to remove contamination from the surface of non-porous materials. Other chemicals may be had for decontamination but their use should be limited due to their toxic nature.

Articles of clothing can normally be easily decontaminated by washing and scrubbing with water containing a strong detergent. This also applies to portions of the exposed individual's body. If efforts to decontaminate items of clothing on the job are unsuccessful, the clothing should be removed immediately to be washed after returning to the home station nearest the job location. Contaminated articles of clothing, rags, etc. should never be laundered in a home or commercial laundry. Such washing and scrubbing is restricted to the job site or the company base. If the contamination cannot be removed economically, the clothing shall be discarded and treated as radioactive waste.

As indicated above (see Paragraph C-2) every effort should be made to decontaminate any contaminated area of the body. Scrubbings should be repeated until activity is removed. The same safety precautions shall be applied to the above operations as were applicable for tracer mixing and injection in particular.

1. Rubber gloves shall be worn during decontamination procedures involving personal contact with the equipment.
2. Food, cigarettes, etc., shall be kept outside the clean-up area. Quantities of radioactive material which present no hazard outside the body can be very dangerous if the same amount is internal.
3. The wash water shall be treated as radioactive waste. If wash water is discharged into sanitary sewerage system, the dilution of the activity by the sewerage must be such that the tolerance established for such disposal by the AEC and Agreement States are not exceeded.

Since we do not have the capability of assaying the wash water for the concentration of contaminant in microcuries per milliliter, we must use the amount of tracer material actually used on the job and the average daily water consumption at the base in determining that we are not exceeding tolerances.

If the wash water is discharged into a septic tank, then the surface of the fluid in the septic tank shall be surveyed after each such decontamination operation, and if any activity above background is noted, the tank shall be posted with a radiation warning sign alerting everyone concerned of the possible hazard.

If standard decontamination efforts are unsuccessful, the procedures to be followed shall depend on the value and ownership of the items involved, the degree of contamination, and the half-life of the contamination activity. Every effort shall be made to thoroughly decontaminate rented or borrowed equipment. If all efforts to decontaminate items of equipment, clothing, etc., have failed to reduce the radioactive contamination to background and the measurable activity is apparently "fixed" the user in charge has three alternatives. They are as follows:

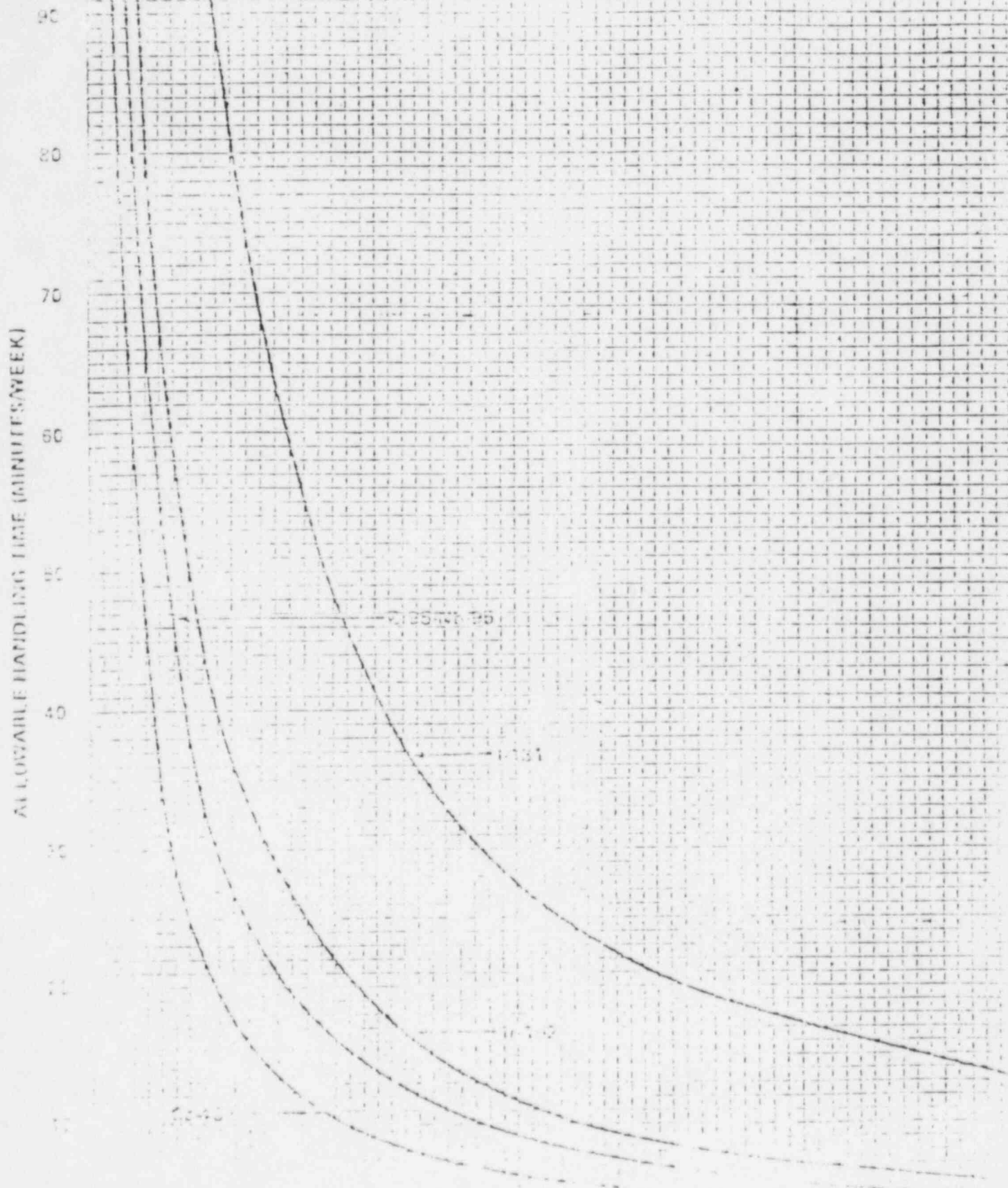
4. If the "fixed" contamination measures less than 0.2 mR/hr at one centimeter, the item of equipment, article of clothing, etc., can be returned to normal use.
5. If the "fixed" contamination measure more than 0.2 mR/hr at one centimeter, the item or items in question shall be treated as radioactive waste and disposed of accordingly.
6. If the item containing the "fixed" contamination (which measures more than 0.2 mR/hr at one centimeter) is such that it is continually used in tracer operations, e.g. parts of a dump bailer, tracter injector, etc., and will be used in no other operation, then it may continue to be used if it is labeled properly and treated as a radioactive source and if the radiation measures less than 2.0 mR/hr at three inches from the surface.

More persistent activities remaining on injection apparatus, customers equipment, etc., are steam cleaned or chemically treated for contamination.

The user in charge shall be responsible for all contaminated equipment. That is, for any equipment, waste, area, or wash water that falls within the above alternative situations. The user in charge shall personally supervise its safe disposition either by staying on the job until the contamination is removed or transporting the equipment to the place where it may be stored awaiting further decontamination efforts.

*Curve includes gamma and neutron

70



Wavelength (microns)

90

80

70

60

50

40

30

20

10

0.25

0.05

0.10

0.20

RADIATION LEVEL (MHEN/HR)

8

7

6

5

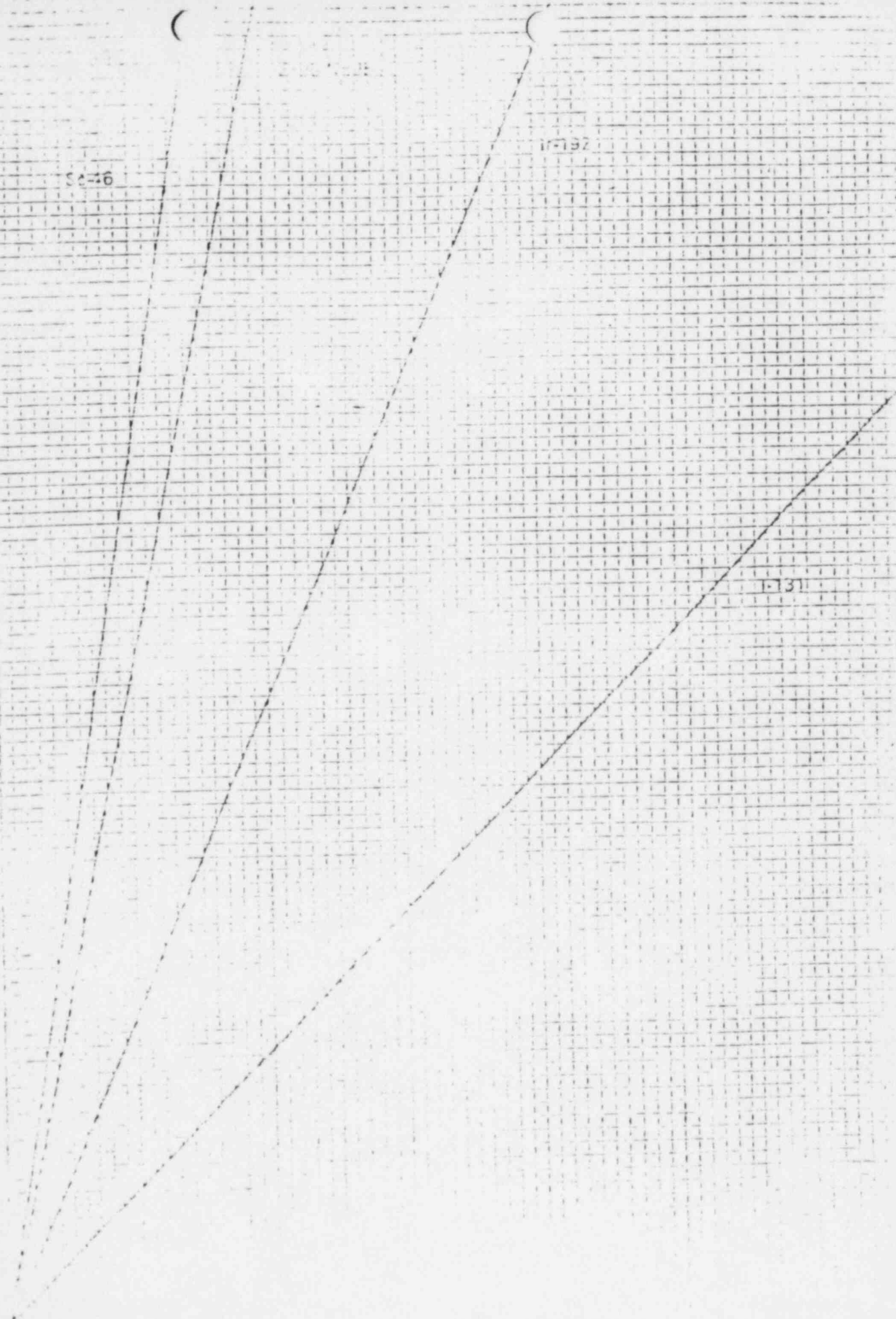
4

3

2

1

0



Control No. 76592

City _____ State _____
County _____
Service _____
Other Personnel _____
District _____
Truck No. _____
Serial No. _____ Date Calibrated _____

Monitoring Procedure Before Leaving Shop
Truck Loaded (Before Leaving Shop)

Count _____ m/min (150 ft. clear of R/A Material)
Isotope _____ Strength _____
Type _____ Strength _____
Front Sign _____ Right Sign _____ Left Sign _____

Monitoring Procedure Before Operations Begin

_____ m/min
Rubber Hose & Fittings _____ Gloves _____
Tools _____ Engr. Hands & Clothing _____ Ejector Tool _____
Work is to be performed _____

Monitoring Procedure After Operations Complete

_____ Rubber Hose & Fittings _____ Gloves _____
Tools _____ Engr. Hands & Clothing _____
Work performed _____ Thyroid Check Engr. _____

Additional Personnel
Name

Additional Personnel
Witness

_____ No. 1 _____ m/min	_____ No. 1 _____ m/min
_____ No. 2 _____ m/min	_____ No. 2 _____ m/min
_____ No. 3 _____ m/min	_____ No. 3 _____ m/min
_____ No. 4 _____ m/min	_____ No. 4 _____ m/min

Is there any significant contamination _____
Remarks _____
Truck taken on job _____
Signature of Trainer _____

Monitoring Procedure Before Leaving Shop (Truck Loaded)

_____ m/min
_____ m/min
_____ m/min
_____ m/min

LOCATION _____ DATE _____

WELL LOCATION AND NUMBER _____

SOURCE NUMBER _____

SURVEY METER SERIAL NUMBER _____ DATE CALIBRATED _____

Truck Survey before leaving: Front _____ mR/hr

Rear _____ mR/hr

Left Side _____ mR/hr

Right Side _____ mR/hr

Cab _____ mR/hr

Control Room _____ mR/hr

E	O	Con- trol Room	C A B
---	---	----------------------	-------------

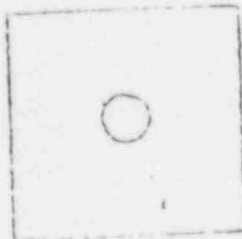
E AmBe

O Cs-137

AREA SURVEY DURING JOB

mR/hr

Remarks



Truck Survey after Job:

Front _____ mR/hr

Rear _____ mR/hr

Left Side _____ mR/hr

Right Side _____ mR/hr

Cab _____ mR/hr

Control Room _____ mR/hr

E	O	Con- trol Room	C A B
---	---	----------------------	-------------

E AmBe

O Cs-137

MONTHLY VEHICLE SURVEY

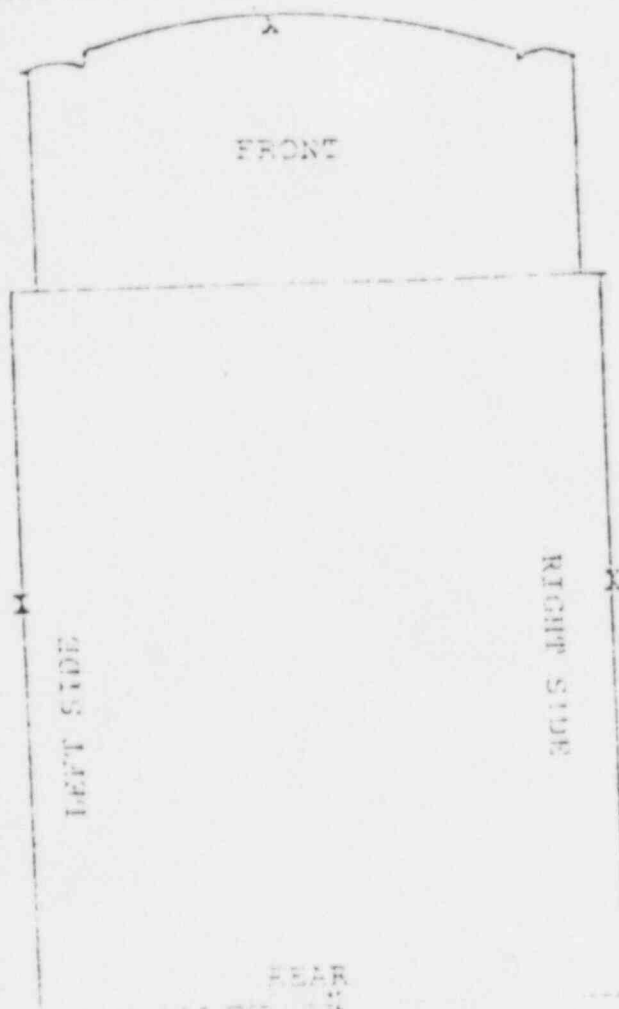
DATE _____

SURVEY METER IDENTIFICATION:

MANUFACTURER _____ SERIAL NO. _____

MODEL NO. _____

ALL READINGS IN MR/HOUR



SURVEY

FRONT	_____	MR/H
REAR	_____	MR/H
R SIDE	_____	MR/H
L SIDE	_____	MR/H

X - DENOTES
POSTING WITH
RADIOACTIVE S

JOB SITE SURVEYS

DATE _____

WELL IDENTIFICATION NAME
AND NUMBER _____

LOCATION- FIELD _____ COUNTY _____
STATE _____

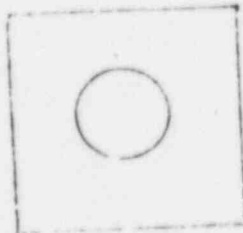
SURVEY BEFORE AND AFTER USE OF RADIOACTIVE MATERIALS

SURVEY METER IDENTIFICATION:

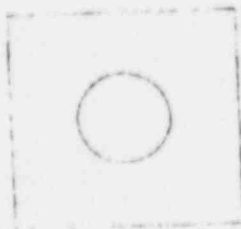
MODEL NUMBER _____ MANUFACTURER _____

SERIAL NUMBER _____

BEFORE READINGS IN MR/HOUR



AFTER READINGS IN MR/HOUR



11

Date: _____
 Removed

Location Used
(Lease and Country)

Date Returned

... ..

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

(SITE RADIATION MONITORING FORM)

DISTRICT _____

DATE _____

COMPANY _____

WELL NAME _____

COUNTY _____ STATE _____

LOCATION _____

RADIOACTIVE TRACER USED _____ IN (LIQUID-)

RADIOACTIVE SOURCE USED _____ SERIAL NO _____

MAXIMUM BACKGROUND ACTIVITY BEFORE COMMENCING OPERATIONS _____

MAXIMUM BACKGROUND ACTIVITY FOLLOWING OPERATION _____

TYPE AND SERIAL NUMBER OF SURVEY INSTRUMENT TYPE _____

SN _____

MEASUREMENTS TAKEN BY _____

(

ISPOCAL

1994-1995
 1996-1997

APPENDIX D

PROCEDURES FOR LOST SOURCE DOWNHOLE

- A. Decision on Recovery of a Source
- B. The Company's Responsibilities
- C. Recovery or Abandonment of a Source
- D. Summary

APPENDIX D

This area is an expansion of part V of Appendix B.

A. Factors influencing the decision on recovery of a source when stuck in an oil well.

1. Cost of the tool versus best estimate of minimum cost and probable maximum cost of recovery.
2. The risk of sticking a drill stem and fishing tools, especially if all zones of interest are above the tool.
3. Interference of the tool with potential production and deeper drilling.
4. Value of clearing the hole for additional logs.

B. When a radioactive source is associated with stuck equipment, the Company becomes more actively involved. Our responsibilities are:

1. Remain in contact with the client and offer our best advice and recommendations regarding safe fishing procedures.
2. Take care to recognize the possibility that a fishing procedure might damage a source capsule.
3. Notify the Nuclear Regulatory Commission or State if it becomes apparent that it be desirable to or advisable to abandon the source in the well.

C. The introduction of the regulatory agencies does not alter the main objective: to recover the source intact or abandon it in such a way as to protect personnel and property in the future.

1. If abandonment of a source appears imminent, the Company notifies the Nuclear Regulatory Commission and State by telephone. We then attempt to determine which line of action is in the best interest of all concerned, what the client wishes to and can reasonably do, and to present a packaged proposal to the regulatory agencies for final approval or further action.

2. Abandonment of a source in a dry hole is simple. All records, including those of the state agency issuing permits for or controlling the drilling of oil and gas wells, should contain information regarding the depth, date, type and quantity of radioactive materials. The well head, if left above the surface, should contain the same information on an engraved durable metal placard.
3. 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 (Figure 1). 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 (Figure 2).
4. In questionable cases the life of the capsule and the solubility of radioactive materials might influence the acceptance of the proposal. (The Company's 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).
5. 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 (Figure 3). 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.
6. In the event a source is left in a producing zone it should be cemented in place if possible. Extreme caution should be used in side tracking to avoid reentering the original hole and damaging the source container (Figure 4). 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

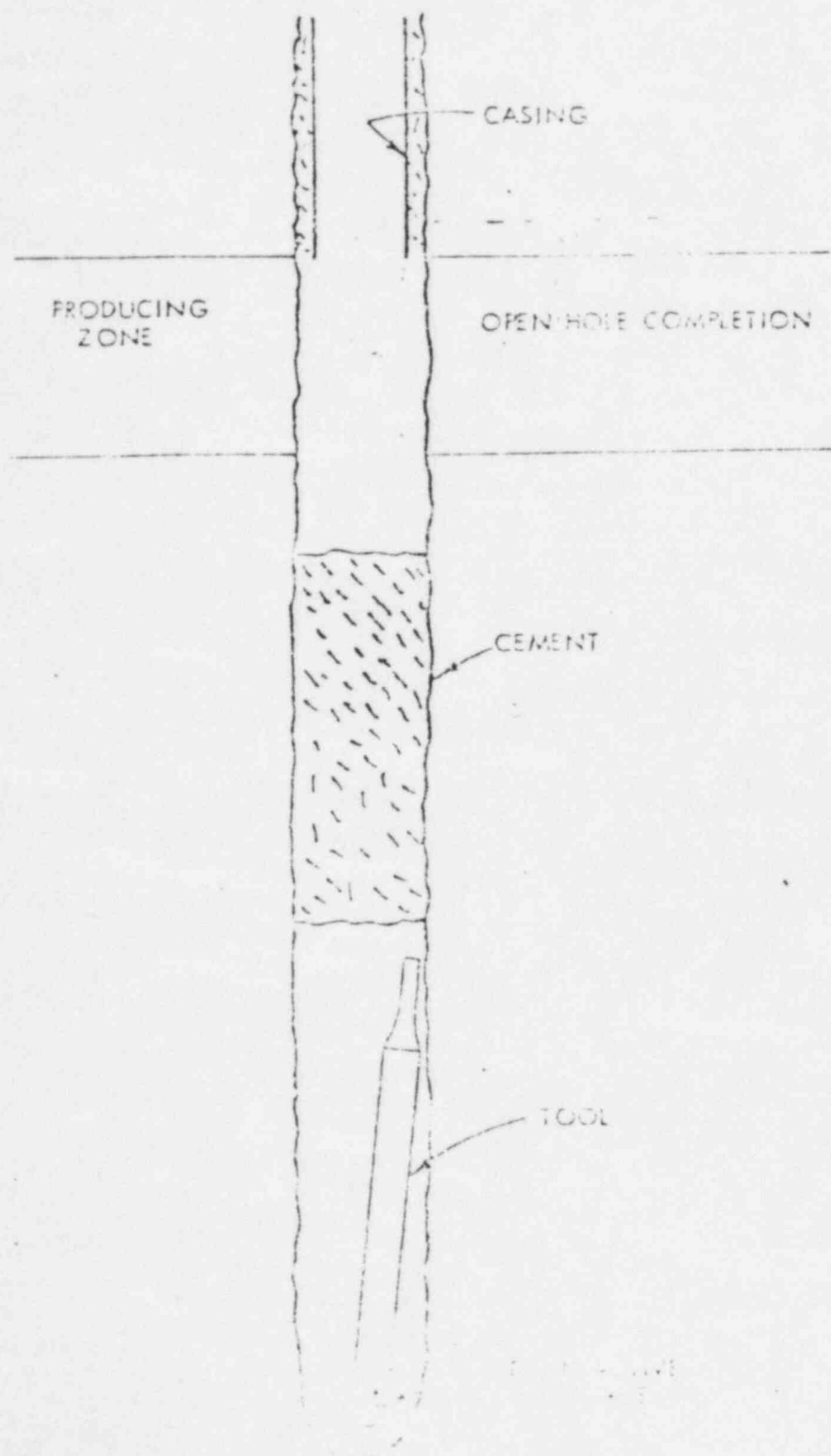
probably harden in a short time to prevent appreciable flow of fluids by the source. In addition, the separation between the new and original hole would reduce the rate of flow at the tool to a very small figure. It is recommended that the new and old holes be separated by at least 15 feet to preclude any possibility of damage to the source by perforating.

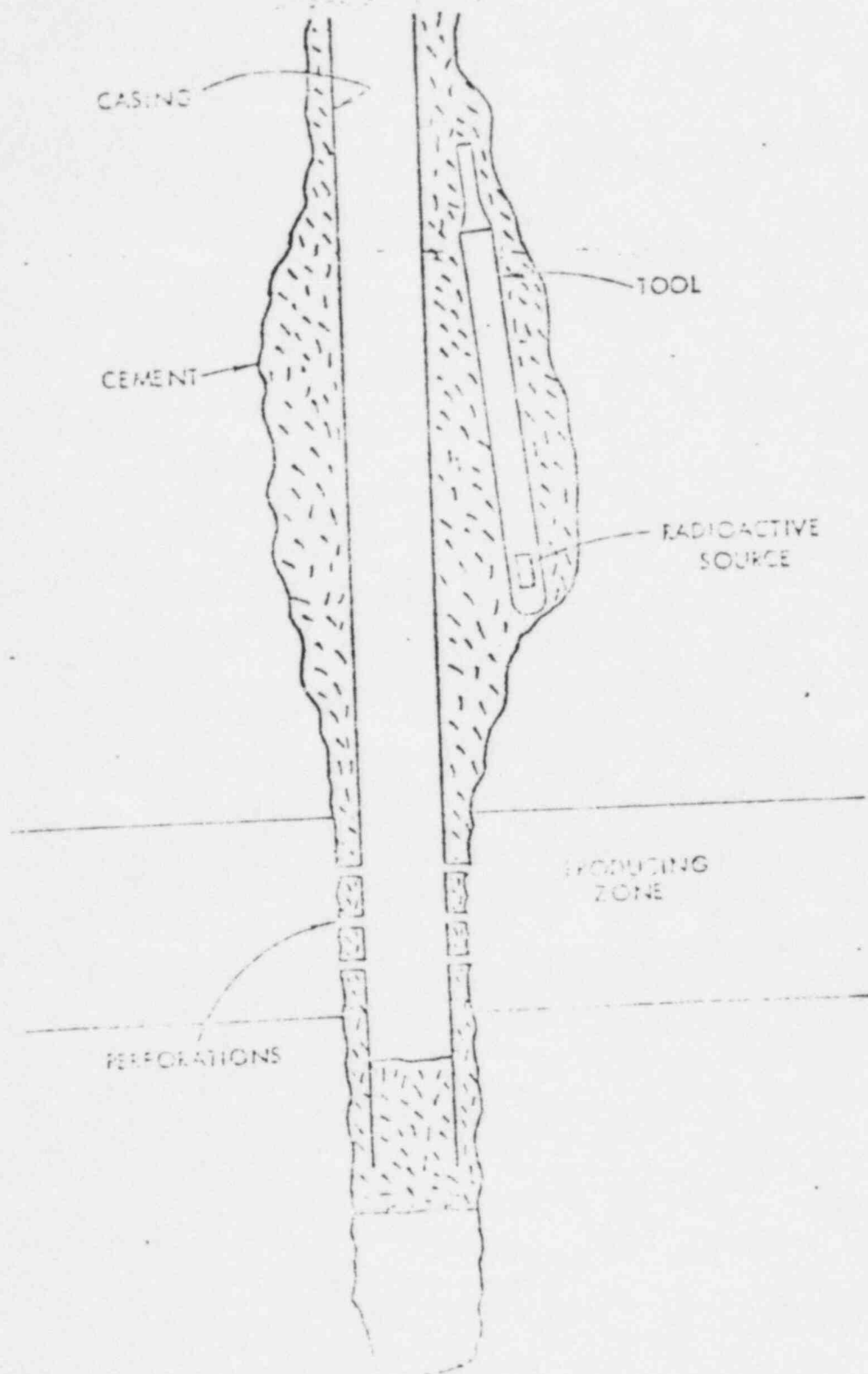
A gamma-ray source abandoned in a well cannot "induce" radioactivity in gas, oil, water, or other materials. For all practical purposes the same may be said of 3 curie, 5 curie and 20 curie AmBe neutron sources. Although neutron flux at one foot from a 3 curie, 5 curie or 20 curie source is negligible in this respect. For example, the flux in a reactor used to activate a cobalt-60 "Pip" tag to 10 microcuries is hundreds of millions times greater than that at one foot from a 5 curie source. Although it is not precisely correct to say that there is no activation, induced radioactivity would be almost immeasurable initially and through decay would be totally obscured by natural background radiation long before the material reached the surface.

D. Summary

1. All precautions should be taken to avoid rupture of a radioactive source during fishing operation. Although each source has been individually pressure tested to 25,000 psi, it is small and will not withstand milling, drilling, or pounding fishing operations.
2. A radioactive source which is intact may be safely abandoned in the well. The decision as to whether to abandon a tool with a source would be based on the accepted considerations for abandoning any other type tool. Added guidelines are the safety aspect, the proper placarding of the well and entering the information in the well records.
3. There should be no costly delay in obtaining approval to abandon a radioactive source in as much as the company keeps the agencies well advised of the progress of the fishing operations as events develop.

4. Responsibility for notifying the regulatory agencies and making all reports is the Company's.
5. It is the client's responsibility to deal with the State agencies issuing permits for drilling oil and gas wells and to furnish that agency with any information which may be required.





12-19985-01

MAY 10 1984

Mid States Logging and Perforating Co.
ATTN: Mr. Donald Gherardini
Manager
North Route 45 Box 39
Fairfield, Illinois 62837

License No. 12-19985-01

Gentlemen:

This refers to the telephone conversation between Mr. Donald Gherardini and Messrs. W. L. Axelson and D. R. Gibbons of my staff on May 9, 1984, regarding the arrangements for an enforcement conference between members of our respective organizations. The meeting is scheduled for 1:00 p.m. (CDT), Friday, May 18, 1984, in the Region III office at 799 Roosevelt Road, Glen Ellyn, Illinois.

The purpose of this meeting is to discuss the findings of the routine inspection conducted April 30 through May 2, 1984, your corrective actions, and enforcement options available to the NRC.

If you have any questions related to this meeting, please contact Mr. Gibbons at (312) 790-5736.

Sincerely,

W. L. Axelson
J. A. Hind, Director
Division of Radiological and
Materials Safety Programs

cc: DMB/Document Control Desk (RIDS)

8405140413
7 pp.

RIII
Gibbons/rr
05/10/84

RIII
Wiedeman
5/10/84

RIII
Axelson

RIII
Hind

A3



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION III
799 ROOSEVELT ROAD
GLEN ELLYN, ILLINOIS 60137

NOTICE OF SIGNIFICANT LICENSEE MEETING

Name of Licensee: Mid States Logging and Perforating Company

License No. 12-19985-01

Date and Time of Meeting: May 18, 1984, 1:00 p.m. (CDT)

Location of Meeting: NRC Region III Office
799 Roosevelt Road
Glen Ellyn, Illinois

Purpose of Meeting: To discuss NRC findings during a recent routine inspection, licensee's corrective actions, and enforcement options available to the NRC.

Region III Attendees:

A. B. Davis, Deputy Regional Administrator
J. A. Hind, Director, Division of Radiological and Materials Safety Programs
S. H. Lewis, Regional Counsel
W. H. Schultz, Enforcement Coordinator
W. L. Axelson, Chief, Materials and Safeguards Branch
D. G. Wiedeman, Chief, Materials Radiation Protection Section 1
D. R. Gibbons, Radiation Specialist, MRPS 1
B. S. Mallett, Chief, Materials Licensing Section

Licensee Attendees:

A. J. Pitcher, Owner
L. D. Pitcher, Owner
Donald Gherardini, Manager
Aaron P. Settles, User, Radiation Safety Officer

NOTE: Attendance by NRC personnel at this Region III licensee meeting should be made known by 9:00 a.m. (CDT), May 17, 1984, via telephone call to D. R. Gibbons, Region III, FTS 388-5736.

Distribution:

L. I. Cobb, Chief, Safeguards and Materials Program Branch, IE
J. Nelson Grace, Director, Division of Quality Assurance, Safeguards, and Inspection Programs, IE
Vandy Miller, Chief, Materials Licensing Branch, NMSS
Jane Axelrad, Director, Enforcement Staff, IE
James Lieberman, ELD, HQ
James G. Keppler, Regional Administrator, Region III

CONVERSATION RECORD

TIME

DATE

5/18/84

TYPE

☐ VISIT☒ CONFERENCE☐ TELEPHONE

ROUTING

NAME/SYMBOL

INT

☐ INCOMING☐ OUTGOING

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT

WITH YOU Don't-horradini, Aaron Setles,
A.J. Pritchard

ORGANIZATION (Office, dept., bureau,

etc.) Mid-States Logging

TELEPHONE NO.

613-842-
9156

SUBJECT

Amendment Request dated May 3, 1984
Contract # 76-720

SUMMARY

B. Mallett met with above individuals after amendment conference and stated that the following items are needed in order to complete review and issue the amendment:

1. The application was submitted unsigned. Need to submit a signed copy.

2. Need to submit fee. Don't-horradini signed check for \$110.00 as payment.

3. For relocation to 45 N. Fairfield, IL:

a. Note on cover letter - when relocate from 45 N. to new place in Alton, IL. - need to submit an amendment request w/ close out survey.

b. Need close-out survey for old place of use at 1013 W. Main, Alton, IL. - NRC inspector Don Gibbons performed during his recent inspection at Mid-States.

ACTION REQUIRED

Tele. dep.

NAME OF PERSON DOCUMENTING CONVERSATION

SIGNATURE

DATE

Bruce Mallett

5/21/84

ACTION TAKEN

gave them copy of new well logging guide.

SIGNATURE

TITLE

DATE

50271-101

© GPO : 1981 O - 361-526 (72277)

CONVERSATION RECORD

OPTIONAL FORM 271 (12-76)
DEPARTMENT OF DEFENSE

A5

CONVERSATION RECORD

TIME

DATE

5/18/84

TYPE

☐ VISIT

☒ CONFERENCE

☐ TELEPHONE

☐ INCOMING

☐ OUTGOING

ROUTING

NAME/SYMBOL INT

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU

ORGANIZATION (Office, dept., bureau, etc.)

TELEPHONE NO.

continued:

Mid States Logging

SUBJECT

*Amendment request
control # 46720*

SUMMARY

5. Contd:

7.6. Need duration of DST for Carroll Wilks.

8.6. We prefer only 1 RSO. If have 2 as indicated, need to delineate what duties of each are (e.g., one is manager & one is pt. of contact for emergencies).

ACTION REQUIRED

Tele. def.

NAME OF PERSON DOCUMENTING CONVERSATION

SIGNATURE

DATE

Bruce Nallett

5/21/84

ACTION TAKEN

gave them copy of new well logging guide

SIGNATURE

TITLE

DATE

CONVERSATION RECORD

TIME

DATE

6/01/84

TYPE

☐ VISIT☐ CONFERENCE☒ TELEPHONE☐ INCOMING☒ OUTGOING

ROUTING

NAME/SYMBOL

INT

Location of Visit/Conference:

NAME OF PERSON(S) CONTACTED OR IN CONTACT WITH YOU

Don Shandini

ORGANIZATION (Office, dept., bureau, etc.)

Mid-States Logging

TELEPHONE NO.

(618)
842-9156

SUBJECT

Amendment request dated May 3, 1984. Cont # 76720.

Lic. No. 12-19985-01.

SUMMARY

B. Mallett explained that NRC has received ~~the~~ response. In order to issue amendment, still need following items:

1. Need program for ensuring that all users are instructed in op & emergency procedures prior to using materials on Mid-States license & on refresher basis. If agreeable, can condition as: the licensee shall ^{provide that} ~~insure~~ all authorized users are instructed in ~~the~~ operating and emergency ~~with~~ procedures prior to initiating work with radioactive materials listed on the license and on a refresher basis.

2. Will add Shandini and Beyers, since both on license for Bureau Service in Army St. Will add them for sealed & unsealed user.

over →

ACTION REQUIRED

NAME OF PERSON DOCUMENTING CONVERSATION

SIGNATURE

Bruce S. Mallett

DATE

5/31/84

ACTION TAKEN

SIGNATURE

TITLE

DATE

50271-101

* GPO : 1981 O - 341-526 (7227)

CONVERSATION RECORD

OPTIONAL FORM 271 (12-76)
DEPARTMENT OF DEFENSE

A6

3. Will add T. Kyron for sealed & unsealed use, and S. Daley for sealed only. If want for unsealed, need training in use.
4. In order to add Langdon & R.E. Childers for sealed & unsealed use, need documentation / evidence that their trainer, Tony Kyron, was/is on an NRC / Agreement State license.
5. In order to add M. Clayton, Carroll Wells, or W.D. Vardner for sealed sources only, need formal training. In addition, if want for unsealed, they all need training / experience in use from individuals on NRC / Agreement State license.

If agree, can issue with cover letter.

ok per D. Ghazdini on 6/1/84 to issue and w/
cover letter - 6/1/84

JUN 14 1984

file

Mid-States Logging & Perforating Co.
ATTN: Donald A. Gherardini
General Manager
Rt. 45 N., Box 39
Fairfield, IL 62283

Gentlemen:

Enclosed is Amendment No. 02 to your NRC License (No. 12-19985-01), which authorizes your new places of use at Fairfield and Albion, Illinois; D. Gherardini, E. Beyers, T. Keylon, and S. Daley as authorized users; new source model numbers; and changes in your Radiation Safety Program. Please note the following:

1. As discussed in a telephone conversation between Donald Gherardini of your staff and me on June 1, 1984, we have added a condition to your license requiring you to instruct all authorized users in your operating and emergency procedures prior to initiating work and on a refresher basis.
2. We have authorized Steve Daley for the use of sealed sources and not iodine-131 or iridium-192 as unsealed sources. In order to obtain this authorization, you will need to submit documentation of his training and/or experience in the use of these materials for tracer operations. This training should be under an authorized user listed on an NRC or Agreement State license performing tracer operations and for a duration of at least 3 months.
3. We have not authorized Larry Oliver or Robert Childers as users as requested. In order to obtain this authorization, you will need to submit documentation indicating that their on-the-job trainer, Tony Keylon, was and/or is on an NRC and/or Agreement State License for the use of sealed and unsealed sources in well logging operations.
4. We have not authorized Michael Clayton, Carroll Wiles, or Samuel Vandever as users as requested. In order to obtain this authorization for the use of sealed sources, you will need to submit documentation of their formal training equivalent to that specified in Item 7. of the enclosed guide.

In order to obtain this authorization for unsealed sources, you will need to submit documentation of the training each individual has received in the use of the materials for tracer operations.

A7

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NMS LIC30
12-19985-01 PDR

4 pp.

5. Your May 3, 1984 letter included a request to add cesium-137 as a Gulf Nuclear, Inc. Model No. RL-1 sealed source. We have not authorized this model number, since the NRC and Gulf Nuclear, Inc. do not have such a model number in their registries. However, we have authorized you for a Gulf Nuclear, Inc. Model No. VL-1 based upon the assumption that this is the source desired.
6. We have modified Condition 14. on your license to prohibit you from removing sealed sources from source holders. If you wish authorization to perform such a service, you will need to submit the information requested in Item 10.2.9.(c) of the enclosed guide.

If you have any questions or require clarification on any of the information stated above, you may contact us at (312) 790-5625.

Sincerely,

Bruce S. Mallett, Ph.D., Chief
Materials Licensing Section

Enclosures:

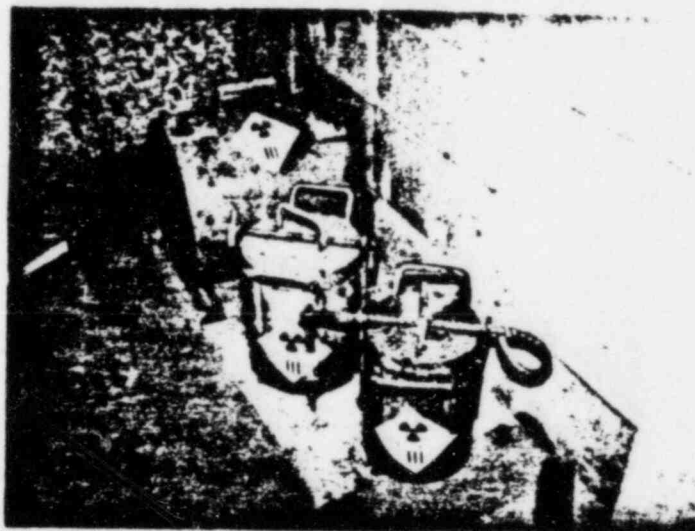
1. Amendment No. 1
2. Guide For Preparation of Applications
for Well Logging Operations

RIII *asm 6/8/84*
Mallett/bm
06/05/84

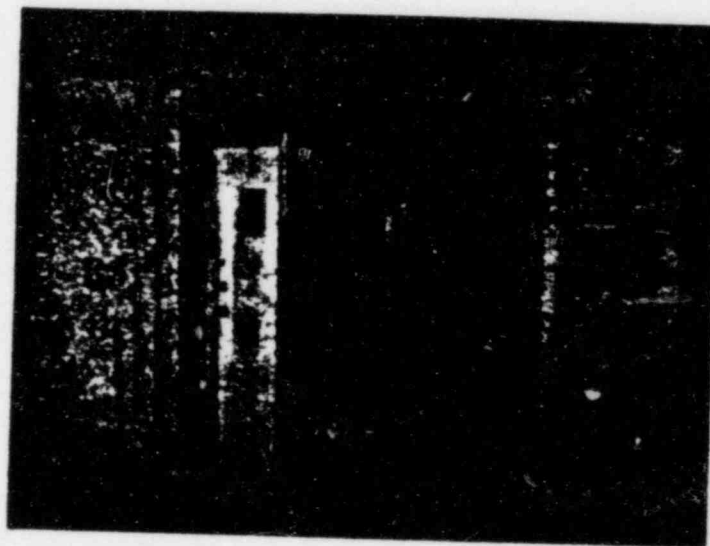
3. Will add T. Kylon for sealed & unsealed sources and S. Daley for sealed only. If want for unsealed, need training in use.
4. In order to add Langdon & R.E. Childers for sealed & unsealed use, need documentation / evidence that their trainer, Tony Kylon, was/is on an NRC / Agreement State license.
5. In order to add M. Clayton, Carol Wilke, or W.S. Vandoren for sealed sources only, need formal training. In addition, if want for unsealed, they all need training / experience in use from individuals on NRC / Agreement State license.

If agree, can issue with cover letter.

ok per D. Jherardine on 6/1/84 to issue around w/
cover letter - 8:10 6/1/84



- Rt. 45 N. Fairfield, IL 62837 -
inside



- Rt. 45 N. Fairfield, IL 62837 -
outside



MS

MID-STATES

logging & pefforating

A cant.
 Check No. 274
 Amount Fee Category 11187A
 Type of Fee amend
 Date Check Rec'd 5/23/84
 Received By L.F.

May 3, 1984

REQUEST FOR AMENDMENTS TO MATERIALS LICENSE # 12-19985-01

Amendment to Condition #2

Rt. 45 N. Box 39, Fairfield, Il. 62837

Amendment to Condition #7

A. Sealed Neutron Source

(Gulf Nuclear Model 71-1)
 (Gammatron Model AN-HP)

B. Sealed Source

(Gulf Nuclear Model CSV)
 (Gulf Nuclear Model RL-1)

C. Any

D. Any

Amendment to Condition # 10

Licensed material may be used and stored at Rt. 45 N. Box 39, Fairfield, Il., and Rt. 130 N. Albion, Il., and used at temporary job sites of the licensee anywhere in the United States where the U.S. Nuclear Regulatory Commission maintains jurisdiction for regulating the use of licensed material.

Amendment to Condition # 12

Licensed material shall be used by, or under the supervision and in the physical presence of

Aaron P. Settles
 Larry Oliver
 Don Gherardini
 Samuel Vandever
 Micheal Clayton

Steve Daley
 Tony Keylon
 Ed Beyers
 Robert Childers
 Carroll Wiles

RECEIVED

MAY 07 1984

REGION III

8407050166 840601
 NMS LIC30
 12-19985-01 PDR

23 pp.

Control No. 76720

MAY 7 1984

0350-19552

RECEIVED BY LFMB	
Date	7/14/84
Log	may 11-4
By	CPD
Orig. To	R-111
Action Compl.	CP

MS

MID-STATES

logging & perforating

Amendment to Supporting Material

Mid-States Logging and Perforating Radioactive Materials Storage, Operating and Emergency Procedures Manual.

Appendix A Section II

The Radiation Safety Officers Are:

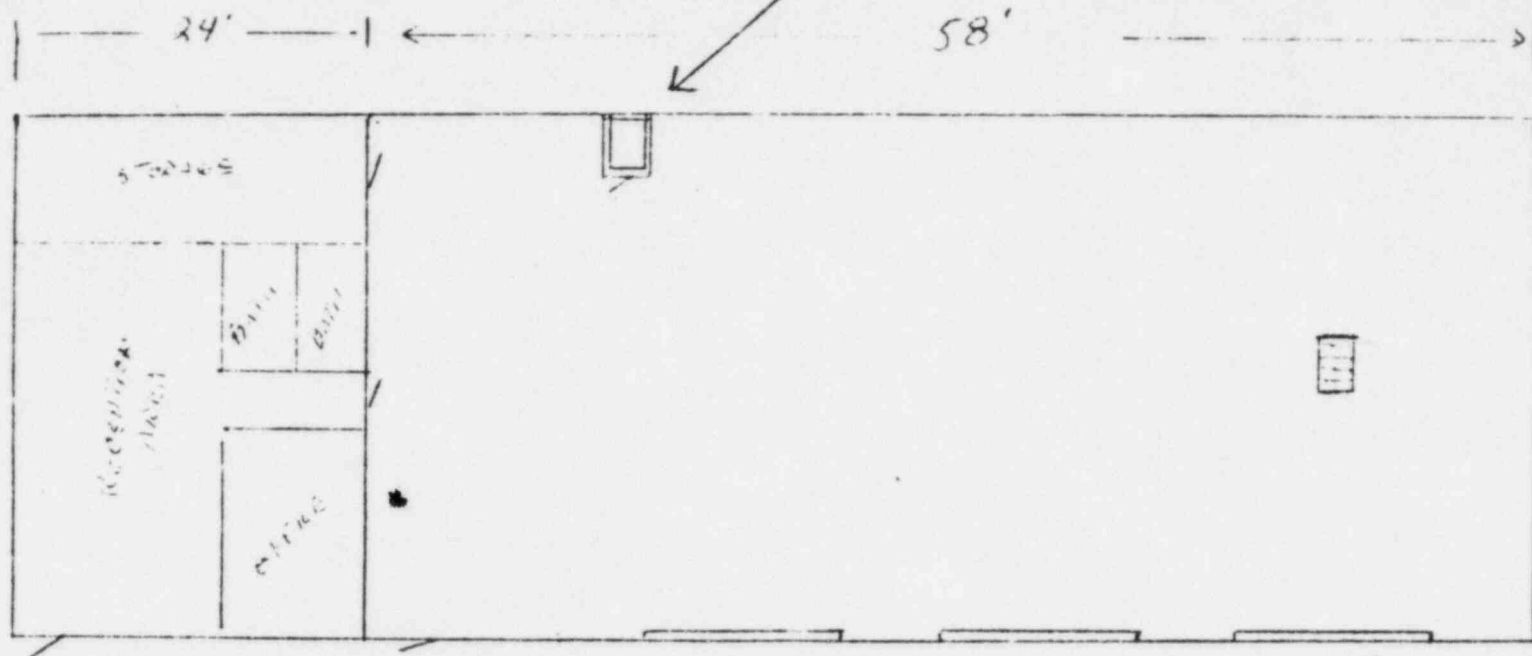
Steven Daley
Larry Oliver

ADDITIONAL SUPPORTING MATERIAL

Building in use at present is Rt. 45 N., Fairfield, Il. There will be no transport of sources between buildings, as when new location is completed, the entire operation of licensee will be moved to Rt. 130 N., Albion, Il., and lease on present building will be terminated. A close-out survey will be performed at time of relocation and submitted for approval by the Commission.

Control No. 76720

Source room concrete block construction with voids in blocks filled with cement. Steel door double locked and access keys controlled by R/A safety officer. Sources stored inside within D.O.T.7A carriers. Placarded accordingly.

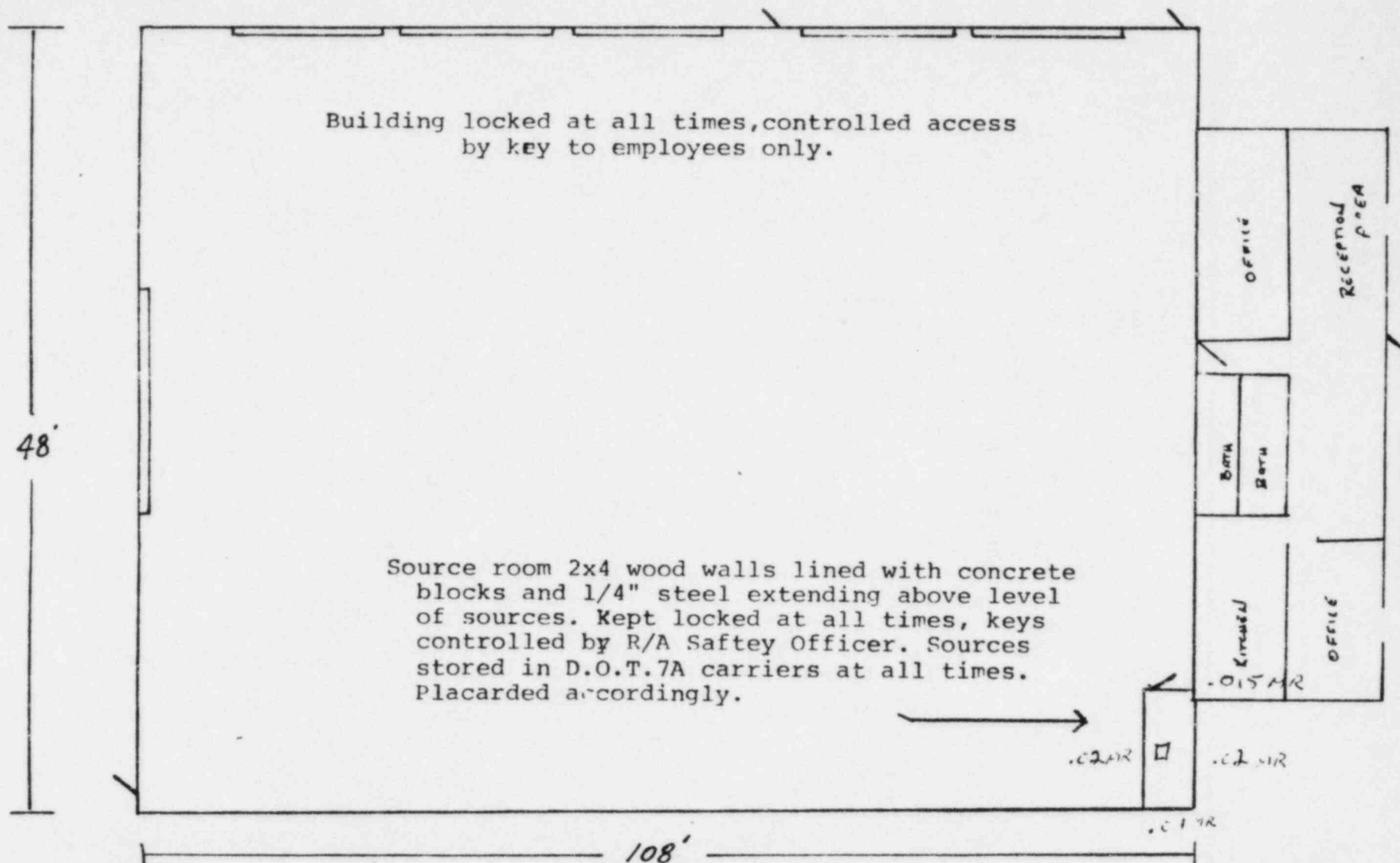


Building locked at all times, controlled access by key to employees only.

RT 130 N. ALBION ILL.

(CONSTRUCTION NOT YET FINISHED)

Control No. 76720



RT 45 N Box 39

1000 T/1

ALL READINGS TAKEN
AT OUTSIDE SURFACE

Certificate

This is to certify that

STEVEN C. DALEY

has successfully completed

*Tracer Technology Services, Inc.
24 Hour Radiation Safety Course
for Well Loggers*

January 13, 1982
DATE

John D. Dunning
INSTRUCTOR
Allen Striegler
PRESIDENT

WELL LOGGING RADIATION SAFETY TRAINING

(Woodell Logging)

NAME Steven C. DaleyDATE Jan 13, 1982

Circle the T if the statement is true, if false circle the F
(1/2 point each)

1. ☐ T ☒ F A survey meter shall be used during any radiation activity or source manipulations.
2. ☒ T ☐ F Half-life: the time in which half the atoms in a radioactive substance disintegrates.
3. ☐ T ☒ F After seven(7) half-lives, you have less than 1% of the radioactivity left.
4. ☐ T ☒ F Radioactivity is the spontaneous disintegration of unstable nuclei with the resulting emission of nuclear radiation.
5. ☐ T ☒ F 3.7×10^{10} disintegration per second is one curie of radioactivity.
6. ☒ T ☐ F The unit of quantity of any radioactivity substance is the curie.
7. T ☐ F A millicurie is one millionth of a curie.
8. ☐ T ☒ F The Nuclear Regulatory Commission (NRC) and agreement states specify that survey meters used by loggers measures as high as 20 mR/hr.
9. ☐ T ☒ F Survey meters are mandatory on your vehicles while transporting radioactive materials.
10. T ☐ F Geiger counters are the most efficient of the principle types of counters.
11. ☐ T ☒ F HVL is the symbol for half value layer in radiation shielding.
12. ☐ T ☒ F REM is a notation for Roentgen equivalent man.
13. T ☐ F The genetic effects of radiation are well documented and it is possible to predict such effects with great accuracy.
14. ☐ T ☒ F In the formula $5(n-18)$, N is the age.
15. ☐ T ☒ F The yearly allowable occupational dose is 5 Rem.

16. (T) F Biological half life is the amount of time that it takes to excrete one half of a radioactive substance from the body.
17. T (F) The body will repair all the damage done to it by radiation.
18. (T) F The basic philosophy in assessing the public health aspects of radiation exposure can be expressed by the following statement: Any unnecessary exposure to radiation should be avoided.
19. (T) (F) For storage of radioactive materials, a sign stating "Caution Radioactive Materials" must be posted on the storage container and the entrance to the storage area room.
20. (C) F "Radioactive" must be posted on four(4) sides on all vehicles transporting radioactive materials with "yellow III" labels.
21. (T) (F) 2 mr/Hr. is the reading that distinguishes between a restricted area and a non-restricted area.
22. (T) F The inverse square law means that if the source is twice as far away as before, the intensity is one fourth as great.
23. (T) F Time-Distance-Shielding are important factors in radiation safety.
24. (T) (F) An acute dose of 750 Rem is a lethal dose of radiation.
25. (C) F Radiation is present in the atmosphere at all times.
26. T (F) The film badge is used for gamma radiation only.
27. (T) F A TLD badge is efficient at monitoring neutrons.
28. (T) F Leak testing of sealed radioactive sources is required every 180 days or six months.
29. T (F) Byproduct materials are fissionable.
30. (T) F Specific activity is not important in determining the physical size of a source of radioactive material.

NAME Steven Daley DATE Jan 13, '82

(#16 - 15 points)

2. Calculate the radiation from 12 millicuries of Iridium-192.

$$\begin{array}{r} 1 \\ 5.7 \\ \underline{1.2} \\ 118 \\ \underline{55} \\ 708 \\ \underline{442} \\ 160.8 \\ \underline{4} \\ 64 \\ \underline{64} \\ 68 \\ \underline{64} \\ 40 \end{array}$$

- lead steel
 Co $\frac{1}{4}$ $\frac{1}{2}$
 Ir $\frac{1}{8}$ $\frac{1}{4}$
 I $\frac{1}{8}$ $\frac{1}{4}$
- $\frac{65.6}{2} \overline{) 131.2}$
 $\frac{12}{11}$
 $\frac{10}{12}$
- $\frac{32.8}{2} \overline{) 65.6}$

- | | | |
|------------------------|------------|--------|
| 0.12 on the X10 Range | <u>1.2</u> | mR/hr. |
| 0.50 on the X10 Range | <u>5.</u> | mR/hr. |
| 0.45 on the X1 Range | <u>45</u> | mR/hr. |
| 0.20 on the X1 Range | <u>20</u> | mR/hr. |
| 0.35 on the X100 Range | <u>35.</u> | mR/hr. |

5. Give three requirements placed on the calibration of survey meters.
- 1) Must be sent in at least every 6 months to a lab like Gulf Nuclear
 - 2) Calibration must be tested twice on each multiplier switch
 - 3) the survey meter must read up to 20 mR/hr at 15% effec. ^{of accuracy}
6. In the event a radioactive material spill occurs in the field, special types of clothing and paraphenalia are required. Name at least four items.
- 1) Plastic gloves
 - 2) Plastic containment material
 - 3) Handling tongs or tools
 - 4) Survey meter
7. Explain, in your own words, what procedure you would follow if you had a radioactive material spill. First I would clear the area of all non essential personnel. Then set the containers up right. Then I would call my R.S.O. I would make sure all clothing and contaminated materials were collected and properly discarded. Anyone that had skin contact would wash. Then the proper reports would be filed.
8. Explain, in your own words, what procedure you would follow if you lost a sealed source in a well. I would call the R.S.O. to let him know that a fishing operation was going to start. I would supervise the operation using the survey meter. The circulating mud would be checked for contamination often during the operation. If the source was not retrieved many reports would be filed.
9. When gaseous radiotracers such as methyl and ethyl iodide are used in the field, why is it recommended that a face mask with an organic filter be worn?
- So that inhalation of radioactive material would not cause internal contamination of the body & lungs

10. Define and explain cause for:

- (a) Radiation sickness is when the body receives an acute or prolonged dose of radiation causing flu like symptoms
- (b) Radiation injury is when a specific part of the body receives a radiation dose that cause burns and irritation to the skin. Radiation injury usually results from handling the R/A material

11. In regard to leak testing a sealed source, (a) Give the proper procedures for wipe testing. (b) How often is it to be taken? (c) What constitutes a leaker?

- a) Gulf Nuclears leak wipe testing works by swabbing the source ~~once~~ once with a soapy solution then swabbing again with a dry swab. b) This is done every six months, when the source # is also taken. c) .003 microcuries

12. There exists in the transportation of radioactive materials a terminology called a "transport index" (TI). Explain what this is.

This is the highest milli-~~roentgen~~^{roentgen} read from the survey meter three feet from the package.

13. What information should appear on job site monitoring sheet?

Name of logging engineer
- 2 Job number
Source number
Date
Location
Reading found on survey meter

Survey meter #
before & after job survey

14. Certain records must be maintained for inspectors from the licensing agencies. List these records.

utilization/master log
job site monitoring sheet
and other logs

- 3

15. In your own words, (a) what procedure would you follow in consolidating several partially filled cans of sand into one larger can; and (b) How would you determine the millicuries in the can; and (c) How would you indicate this on your utilization/master log?

A) Inventory Consolidation Procedure

- 1) Mix the unused portion of each container into one container.
2) Take background reading more than 50' from R/A meterail
3) Find millicuries by using survey meter. Inverse square law will be used if meter pings out at 1'
4) Subtract background from results in step 3
5) The difference between what is marked on cans and your figure is indicated on log as radiation desaturation.

16. As the logger in charge of the job, what requirements are placed on you in making sure your truck, personnel, and operations are in compliance with NRC or state regulations?

The logger is required to uphold all regulation set by the NRC and state regulations. You are to make sure that any personnel entering into a restricted radiation area must ~~not~~ have a film badge on its person. No one is to eat, drink or smoke in this area.

-2

MID-STATES

logging & perforating

Donald Gherardini:

Three years field experience as senior engineer with Burgener Services in Olney, Il. Responsible for source handling in respect to well logging and RA tracer surveys. Experience includes handling of CS 137, AmBe 241, Iridium 192, and field experience in fishing for tools lost in hole. Attended safety classes instructed by Hubert Rennert, and personally instructed by him in the field.

Previously employed by Dresser Atlas and completed course of instruction for RA source handling for operators written by Dresser Atlas Company, supervised and counseled by Company Radiation Safety Officer and company engineers.

Ed Beyers:

Three years field experience as senior engineer with Burgener Services in Olney, Il. Supervised handling of sources and other RA materials used in well logging and tracer surveys, including CS 137 and AmBe 241 logging sources and Iridium 192. Experience includes overseeing of fishing operations for tools lost in open hole.

Attended well logging course and RA safety course instructed by Hubert Rennert. Was also under Mr. Rennert's personal supervision during training period.

Steven Daley:

Three years experience with Woodell Logging in Mattoon, Il. Supervised the handling of CS 137 and AmBe 241 in mineral and oil well logging. Successfully completed Radiation Safety course instructed by John Hamley of Tracer Technology Services, Inc., Fort Worth, Tx., after one year experience at Woodell Logging.

Administered leak wipe tests in compliance with NRC regulations. Was trained by Dennis Fathauer, Radiation Safety Officer, to be able to deal with any necessary procedures in handling radioactive materials.

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SS#: 412-19-5694
DOB: 8-25-58
DOE: 6-1-83

Tony Alan Keylon
Rt. 1
Mountain Springs, Ky.

Employed by Basin Surveys, Inc., trained by C.M. Bower, Marshall Hickman, and Fred Staggs. 5 years of on the job training in handling of CS-137, Ambe-241, and Iodine-131. Including monthly safety meetings with classroom type instruction.

Gulf Nuclear, Inc. Radiation Safety training course was successfully completed on April 14, 1982. Instructed by Frank Malek.

Have received Kentucky License for ML McCullough-Basin Surveys Shop in Paintsville, Ky. with myself as primary Radiation Safety Officer.

Mid States Logging & Perforating by Aaron Settles. 4 months of on the job training in handling of CS-137 and Ambe-241.

Certificate included



This certificate indicates that Tony A. Keylon
has satisfactorily completed an instruction and training course for Radiation
Safety for oil well logs by
April 14, 1982
Date
Gulf Nuclear, Inc.
Houston, Texas

Frank A. Reid
Instructor

Walter H. Hight
Director

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SS#: 407-94-1471

DOB 6-25-60

DOE 1-16-84

Larry Dean Oliver
Rt. 1
Mountain Springs, Ky.

Employed by Basin Surveys, Inc. Trained by Tony Keylon. 1 Year on the job training in handling of CS-137, Ambe-241, and Iodine-131 Including monthly safety meetings with classroom type instruction.

Gulf Nuclear, Inc. Radiation Safety Training course was successfully completed on September 1, 1982. Instructed by Frank Malek.

Certificate included



Certificate

This certificate indicates that Larry D. Oliver
*has satisfactorily completed an instruction and handling training course for Radiation
Safety for oil well logging.*

September 1, 1982

Date

**Gulf Nuclear, Inc.
Houston, Texas**

Frank Malik

Instructor

Walter P. Peebles, Jr.

Walter P. Peebles, Jr.
President

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logging & perforating

SS#: 337-28-5533
DOB: 7-7-36

Carroll Ray wiles
Rt. 1
Mountain Springs, Ky.

Employed by Basin Surveys, Inc. Trained by Mike Dinsmore.^{supervisor} On the job training
in handling of CS-137, Ambe-241, and Iodine-131.

Mid States Logging and Perforating; Trained by Aaron Settles. On the job training
in handling of CS-137, Ambe -241.

Control No. 7.67.20

MID-STATES
logging & perforating

SS#: 411-70-8919

DOB: 2-18-43

DOE: 4-16-83

William Samuel Vandever
Rt. 1
Mountain Springs, Ky.

Employed by Easin Surveys, Inc. Trained by Tony Keylon. 4½ years of on the job training in handling of CS-137, Ambe-241, and Iodine-131 including monthly safety meetings with classroom type instruction.

Mid States Logging & Perforating, trained by Aaron Settles. 1 year of on the job training in handling of CS-137 and Ambe-241.

Control No. 76720

MID-STATES
logging & perforating

SS#: 335-56-4242

DOB: 7-16-57

DOE: 7-28-82

Michael Lee Clayton
Rt. 3 Box 434
Stanton, Ky. 40380

Employed by Basin Surveys Inc. Trained by Mike Dinsmore 6 months of on the job training in handling of CS-137 and Ambe 241

Mid States Logging and Perforating: 2 years of on the job training in handling of CS-137 and Ambe 241 by Asron Settles.

Illini by Bill Dent: 4 months of on the job training in handling of CS-137 and Ambe-241.

MID-STATES
logging & perforating

SS#: 402-94-3353

DOB: 6-19-60

DOE: 1-16-84

Robert Earl Childers
Rt. 1
Mountain Springs, Ky.

Employed by Basin Surveys, Inc. Trained by Tony Keylon. 1 year on the job training in handling of CS-137, Ambe-241, and Iodine-131. Including monthly Safety meetings with classroom type training.

Control No. 7 6 7 2 0

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Amendment to Supporting Material

Mid-States Logging and Perforating Radioactive Materials
Storage, Operating and Emergency Procedures Manual.

Appendix A Section I

The Radiation Protection Officer is:

Aaron Settles

Appendix A Section II

The Radiation Safety Officers are:

Steven Deley
Larry Oliver

Appendix B Section I Paragraph C

Receiving of Radioactive Material by designated persons reporting to the Radiation Safety Officer, who shall perform inspection of said material and documentation, then material to be placed in storage facility until needed. Unsealed sources shall remain in shipping container, inside storage facility, until required.

Appendix C Section I

All tracer material preparations will be made in the field, where immediate use of the material will be made. Precautions will be taken in the handling of material, according to Section III of this part and to manufacturer's recommendations concerning loading of injection tools, if such tools are used.

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Appendix C Section III Paragraph D

Equipment for field preparation of Radioactive Material for tracer studies shall include a plastic tray lined with an absorbant material, whereby the handling of all liquid Radioactive Material shall be done in such a manner that if any spills should occur they shall be contained.

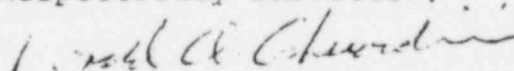
ADDITIONAL SUPPORTING MATERIAL

Building in use at present is Rt. 45 N., Fairfield, Il. There will be no transport of sources between buildings, as when new location is completed, the entire operation of licensee will be moved to Rt. 130 N., Albion, Il., and lease on present building will be terminated. A close-out survey will be performed at time of relocation and submitted for approval by the Commission.

I hereby testify that these procedures will be followed accordingly, and that supporting material is, to the best of my knowledge, correct.

I then request that these amendments to Materials License number 12-19985-01 in the name of Mid-States Logging & Perforating Co. be ratified.

Respectfully submitted,



Donald A. Gherardini
General Manager

MS

MID-STATES

logging & perforating

Carroll Ray Wiles
Rt. 1
Mountain Springs, KY

SS#: 337-28-5533
DOB: 7-7-36

Employed by Basin Surveys, Inc., Trained by Mike Dinsmore. On the job training in handling of CS-137, AMBE-241, and Iodine-131. Employed 2 years.

Mid-States Logging and Perforating: Trained by Aaron Settles. On the job training in handling of CS-137, AMBE-241. Employed 1 ½ years.