NRC FORM 313
(7-86)
10 CFR 30, 32, 33, 34, 35 and 40

U.S. NUCLEAR REGULATORY COMMISSION
APPROVED BY OMB
3150-0120
Expires: 5-31-87

APPLICATION FOR MATERIAL LICENSE

INSTRUCTIONS: SEE THE APPROPRIATE LICENSE APPLICATION GUIDE FOR DETAILED INSTRUCTIONS FOR COMPLETING APPLICATION. SEND TWO COPIES OF THE ENTIRE COMPLETED APPLICATION TO THE NRC OFFICE SPECIFIED BELOW.

APPLICATIONS FOR DISTRIBUTION OF EXEMPT PRODUCTS FILE APPLICATIONS WITH:

U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF FUEL CYCLE AND MATERIAL SAFETY, NMSS
WASHINGTON, DC 20555

ALL OTHER PERSONS FILE APPLICATIONS AS FOLLOWS. IF YOU ARE LOCATED IN:

CONNECTICUT, D.C., DELAWARE, DISTRICT OF COLUMBIA, MAINE, MARYLAND, MASSACHUSETTS, NEW HAMPSHIRE, NEW JERSEY, NEW YORK, PENNSYLVANIA, RHODE ISLAND, OR VERMONT, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION I
NUCLEAR MATERIALS SAFETY SECTION B
631 PARK AVENUE
KING OF PRUSSIA, PA 19406

ALABAMA, FLORIDA, GEORGIA, KENTUCKY, MISSISSIPPI, NORTH CAROLINA, PUERTO RICO, SOUTH CAROLINA, TENNESSEE, VIRGINIA, VIRGIN ISLANDS, OR WEST VIRGINIA, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION II
NUCEAR MATERIALS SAFETY SECTION
101 MARIETTA STREET, SUITE 2900
ATLANTA, GA 30323

IF YOU ARE LOCATED IN:

ILLINOIS, INDIANA, IOWA, MICHIGAN, MINNESOTA, MISSOURI, OHIO, OR WISCONSIN, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION III
MATERIALS LICENSING SECTION
799 ROOSEVELT ROAD
GLEN ELLYN, IL 60137

ARKANSAS, COLORADO, IDAHO, KANSAS, LOUISIANA, MONTANA, NEBRASKA, NEW MEXICO, NORTH DAKOTA, OKLAHOMA, SOUTH DAKOTA, TEXAS, UTAH, OR WYOMING, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION IV
MATERIAL RADIATION PROTECTION SECTION
611 RYAN PLAZA DRIVE, SUITE 1000
ARLINGTON, TX 76011

ALASKA, ARIZONA, CALIFORNIA, HAWAII, NEVADA, OREGON, WASHINGTON, AND U.S. TERRITORIES AND POSSESSIONS IN THE PACIFIC, SEND APPLICATIONS TO:

U.S. NUCLEAR REGULATORY COMMISSION, REGION V
NUCLEAR MATERIALS SAFETY SECTION
1450 MARIA LANE, SUITE 210
WALNUT CREEK, CA 94596

PERSONS LOCATED IN AGREEMENT STATES SEND APPLICATIONS TO THE U.S. NUCLEAR REGULATORY COMMISSION ONLY IF THEY WISH TO POSSESS AND USE LICENSED MATERIAL IN STATES SUBJECT TO U.S. NUCLEAR REGULATORY COMMISSION JURISDICTION.

1. THIS IS AN APPLICATION FOR *(Check appropriate item)*

- [ ] A. NEW LICENSE
- [ ] B. AMENDMENT TO LICENSE NUMBER _____
- [XX] C. RENEWAL OF LICENSE NUMBER 30-16251-01

2. NAME AND MAILING ADDRESS OF APPLICANT *(Include Zip Code)*

U.S. Geological Survey (WRD)
4501 Indian School Rd NE, Suite 200
Albuquerque, NM 87110

3. ADDRESS(ES) WHERE LICENSED MATERIAL WILL BE USED OR POSSESSED.

Temporary job sites of the applicant performing geophysical borehole logging and depth moisture investigations throughout the U.S. and Possessions; headquarters at same address.

4. NAME OF PERSON TO BE CONTACTED ABOUT THIS APPLICATION

Jim D. Hudson

TELEPHONE NUMBER: 505-262-6642

SUBMIT ITEMS 5 THROUGH 11 ON 8½ x 11" PAPER. THE TYPE AND SCOPE OF INFORMATION TO BE PROVIDED IS DESCRIBED IN THE LICENSE APPLICATION GUIDE.

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

6. PURPOSE(S) FOR WHICH LICENSED MATERIAL WILL BE USED.

7. INDIVIDUAL(S) RESPONSIBLE FOR RADIATION SAFETY PROGRAM AND THEIR TRAINING AND EXPERIENCE

8. TRAINING FOR INDIVIDUALS WORKING IN OR FREQUENTING RESTRICTED AREAS.

9. FACILITIES AND

8804280408 880218
REG4 LIC30
30-16251-01 PDR

10. RADIATION SAFETY PROGRAM.

11. WASTE MANAGEMENT.

12. LICENSEE FEES *(See 10 CFR 170 and Section 170.31)*

FEE CATEGORY | AMOUNT ENCLOSED $

13. CERTIFICATION. *(Must be completed by applicant)* THE APPLICANT UNDERSTANDS THAT ALL STATEMENTS AND REPRESENTATIONS MADE IN THIS APPLICATION ARE BINDING UPON THE APPLICANT.

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT NAMED IN ITEM 2, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH TITLE 10, CODE OF FEDERAL REGULATIONS, PARTS 30, 32, 33, 34, 35, AND 40 AND THAT ALL INFORMATION CONTAINED HEREIN, IS TRUE AND CORRECT TO THE BEST OF THEIR 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.

SIGNATURE–CERTIFYING OFFICER	TYPED/PRINTED NAME	TITLE	DATE
Jim D Hudson	Jim D. Hudson	Radiation Safety Officer	12/10/87

14. VOLUNTARY ECONOMIC DATA

a. ANNUAL RECEIPTS

- [ ] < $250K
- [ ] $250K – 500K
- [ ] $500K – 750K
- [ ] $750K – 1M
- [ ] $1M – 3.5M
- [ ] $3.5M – 7M
- [ ] $7M – 10M
- [ ] > $10M

b. NUMBER OF EMPLOYEES *(Total for entire facility excluding outside contractors)*

c. NUMBER OF BEDS

d. WOULD YOU BE WILLING TO FURNISH COST INFORMATION *(dollar and/or staff hours)* ON THE ECONOMIC IMPACT OF CURRENT NRC REGULATIONS OR ANY FUTURE PROPOSED NRC REGULATIONS THAT MAY AFFECT YOU? *(NRC regulations permit it to protect confidential commercial or financial–proprietary–information furnished to the agency in confidence)*

- [ ] YES
- [ ] NO

FOR NRC USE ONLY

TYPE OF FEE	FEE LOG	FEE CATEGORY	COMMENTS	APPROVED BY

AMOUNT RECEIVED	CHECK NUMBER		DATE

Item 5 NRC-313 Radioactive Material Lic.No. 30-16251-01

	5a. - Element and Mass Number	5b. - Chemical and/or Physical form (Manufacturer and Model no. of Sealed Sources)
1.	Americium-241:Be	1. Sealed neutron sources (Gamma Industries Model VD-HP) or (Gammatron Inc. Model AN-HP)
2.	Cobalt-60	2. Sealed sources (Gammatron Inc. Model GT-GHP)
3.	Cesium-137	3. Sealed sources (Gamma Industries - Model VD-HP)
4.	Americium-241	4. Sealed Sources Tro:.ler Dwq. A-102700
5.	Americium-241	5. Sealed Sources - Gamma Industries VD(HP)

5c. Maximum Amounts

1. Not to exceed 3 curies per source
2. Not to exceed 10 millicuries per source
3. Not to exceed 350 millicuries per source
4. Not to exceed 350 millicuries per source
5. Not to exceed 350 millicuries per source

Item 6 NRC form 313 Lic. No. 30-16251-01

Purpose for which licensed material will be used

1. To be used for geophysical well logging in hydrologic studies
2. Same
3. Same
4. To be used in Troxler Model 3200 series gauges to measure moisture content of shallow formations.
5. To be used for formation desnity measurements.

Item 7 NRC form 313 Training and experience Lic. No. 30-16251-01

Jim D. Hudson (Radiation Safety Officer - appointment July 1973)

Training Subject	Conducted by
Surface radiation surveys and radiation logging	Western U.S. and Marshall Islands (on-job-training beginning 1965)
Principals of radiation protections Biological effects of radiation - Radiological monitoring for instructors. Math and calculations basic to measure of radioactivity	Univ. Colo. (Formal tun. 1 week Jure 3, 1971) on-job-training beginning 1965 instruct (R.S.O.) beginning 1977
Radiation Safety Orientation	Nat'l Trn. Center Denver, CO (40 hrs. July 1977)
Radiation Safety for well Loggers	Support Consultants Okla. City, OK (40 hrs. Nov. 1981)
Troxler Nuclear gauges training course	Troxler Div. Albuquerque, NM (8 hrs. Sept. 1983)
Radiation Safety in well Logging Operations	F.L. Clifford Assoc. Evansville, Ind (40 hrs. Sept 1986)

Item 7 NRC form 313 Training and experience Lic. No. 30-16251-01

James A. Basler (Logging supervisor - appointment July 1977)

Training Subject	Conducted by
Surface radiation surveys and radiation logging	Dept. of Interior (on-job training) beginning January 1977
Principals of radiation Protection Monitoring and instruments	Dept. of Interior (on-job training) beginning January 1977
Math & Calculations basic to meas. of radiation Biological effects of radiation	Dept. of Interior classroom - 1 week (January 1983)
Radiation Safety Orientation	Nat'l Trn. Center (40 hrs. July 1977) Denver, Co
Radiation Safety for well Loggers	Support Consultants (40 hrs. Sept. 1981)
Troxler Nuclear gauge training course	Troxler Div. (8 hrs. Sept. 1985. Albuquerque, NM

Item 7 NRC form 313 Training and experience Lic. No. 30-16251-01

R.K. Dewees (Logging Supervisor-appointment Sept. 1984)

Training Subjects	Conducted by
Surface radiation survey and radiation logging	Dept. of Interior (on-job training) beginning January 1983
Principals of radiation protection	Dept. of Interior (on-job training) beginning January 1983
Math & Calculations basic to meas. of radioactivity	Dept. of Interior (on-job training) beginning January 1983
Radiation Safety Orientation (includes provisions in 10 CFR part 39, para. 39.63)	Dept. of Interior
Radiatior Safety in well logging Operations (includes provisions in 10 CFR part 39, para. 39.61)	F.L. Clifford Assoc. (40 hrs. - Sept 84) Evansville, Ind

Item 7 NRC form 313 Training and experience Lic. No. 30-16251-01

Roy R. Cruz (logging supervisor - appointment July 1977)

Training Subject	Conducted by
Surface radiation surveys and radiation logging	Dept. of Interior (on-job trai) January 1977
Principals of radiation protection monitoring and instruments	Dept. of Interior (on-job training) beginning Jan. 1977 classroom - 1 week Jan. 1983
Math & Calculations basic to meas. of radiation Biological effects of radiation	Dept. of Interior classroom - 1 week (Jan. 1983)
Radiation Safety Orientation	Nat'l Trn. Center (40 hrs. July 1977) Denver, Co
Radiation Safety for well Loggers	Support Consultants (40 hrs. Nov. 1981) Okla. City, OK
Troxler Nuclear gauge Training Course	Troxler Div. (8 hrs. Sept. 1985) Albuquerque, NM
Radiation Safety in well logging operations	F.L. Clifford Assoc. (40 hrs. Sept. 84) Evansville, Ind.

Item 7 NRC form 313 Training and experience Lic. No. 30-16251-01

Steven F. Richey (Logging assistant - appointment Oct. 1985)

Training Subject	Conducted by
Surface radiation survey and radiation logging - principals of radiation protection, operations and emergency procedures - Basic meas. and calculations of dose rates	Dept. of Interior (on-job training) beginning Jan 1983 R.S.O instructions Jun. 83 - 4 hrs.
Radiation Safety in well Logging operations	F.L. Clifford Assoc. (40 hrs. Oct. 85) Denver, Co

Item 7 NRC form 313 Training and experience Lic. No. 30-16251-01

Shareen G. Duncan (Logging assistant - appointment May 1985)

Training Subject	Conducted by
Surface radiation surveys and radiation logging principals of radiation protection - operating and emergency procedures - Basic meas. and calculations of dose rates	Dept. of Interior (on-job training) beginning July 1983 R.S.O. instructions 4 hrs. July 1983
Radiation Safety in well Logging operations	F.L. Clifford Assoc. (40 hrs. May 1985) Denver, CO
Troxler Nuclear gauges Training Course	Troxler Div. (40 hrs. Aug. 1984)

Item 8.3 NRC form 313 Lic. No. 30-16251-01

Training for individuals working in or frequenting restricted areas

Temporary assistants used in well logging operations will receive training given by the Radiation Safety Officer including the following subjects.

1. Location of radioactive materials - use of remote handling tools and survey instruments.
2. Standard and emergency operating procedures as applied to the fundamentals of radiation safety in order to minimize exposure to radioactive material.
3. The appropriate response in any situation which may lead to cause a violation of NRC regulations, license conditions, unnecessary exposure or release of radioactive material to the environment.

Temporary assistants will not handle radioactive material and will maintain a distance in order to reduce the exposure level as low as practical.

Logging assistants will not be appointed until completion of a minimum of 40 hrs. of formal radiation safety training, conducted by a professional consultant group, and a minimum of three months on-the-job training.

Logging Supervisors will not be appointed until completion of a minimum of 40 hours of formal radiation safety training, conducted by a professional consultant group, covering all of the topics listed in paragraph 39.61(e) of 10 CFR part 39.

Supervisors will serve a minimum of 3 months (520 hours) as logging assistants and must demonstrate a through knowledge of the terms and conditions of the current license requirements, including the operating and emergency procedures, radiation survey instruments, and remote handling tools.

Logging supervisors and assistants must achieve a passing grade on a written examination of approximately 50 questions, covering all of the subject matter in paragraph 39.61(e), following completion of the formal training program designed specifically for radiation safety in well logging operations. A certificate of satisfactory completion will serve as proof of a passing level of achievement.

Annual safety reviews will be provided for logging supervisors and assistants. The safety review and oral examination will be conducted by the Radiation Safety Officer.

General Topics of discussion are:

1. Information concerning storage, transfer, and use of radioactive material.

2. The basic principals and fundamentals of radiation safety and good safety practices as related to daily operations.

3. Responsibility to report any condition which may lead to or cause a violation of NRC regulations, license conditions, or unnecessary exposure to or release of radiation.

4. The appropriate response in the event of any unusual occurence or malfunction which may lead to unnecessary release or exposure to radiation.

Item 9 NRC Form 313 Lic. No. 30-16251-01

Facilities and Equipment

Radioactive sources are generally stored in the geophysical logging truck in the location indicated in the physical survey sketch. All source containers are bolted to the floor and kept locked when not in use. The source compartment, of the truck, is kept locked of all times, except at the job site.

Storage Area

Sources not needed at the job site will be stored at a Government owned warehouse facility. This facility is secured by a eight-foot chain-link fence with controlled access. A portion of the warehouse facility is posted and accessible to authorized personnel, only. The sources are stored in a locked room accessible only to the personnel listed on the material license and is posted: "Caution Radiation Area Authorized Personnel Only"

A radiation meter will be used to monitor the radiation level before removing any source from storage. The reading shall be taken a distance of three feet from the source area and recorded, with the date, on the note sheet posted near the source area. Compare the current meter reading with previous readings to dscertain no large deviation. If a large (move than 5 MR/hr) deviation is noted, the source area shall remained locked until notification of the R.S.O. or management.

Only authorized personnel, wearing TLD personnel monitoring badge, shall have access to the material storage area.

Only encapsulated sources in manufactor's source containers will be stored.

Material removed from storage, for use, must have a current leak test performed by Eberline Corp. Each source container will be labeled with the radioisotope, activity, and the expected dose rate at a distance of three feet, when the source is in the container. Material to be removed, for any use, will be monitored, with the radiation meter. This reading should be comparable with the dose rate posted on the label. Any sources failing this comparison or having a suspicious nature will be isoloated until notification of management.

The source area will remained locked or attended at all times.

The storage facility is located at 1600 12th N.W., Albuquerque, NM

Item 9 NRC Form 313 Facilities & Equipment Cont.

The 3 curies AM-BE source are encased in the source holder as shown in the attached diagram in item 9. These source holders are not opened to the source. The holders with the source inside are removed, by gloved hand, from a receptical in the center of the source shield container described in item 9. The source holder (with source inside) is screwed directly onto the probe assembly. This is done with gloved hands and at arms length from the body. This only takes a few seconds to accomplish and has been determined to be the most efficient method, resulting in minimal exposure to the operator.

The Co^{60} sources (10 MC) are a small pellet cylinder (1/4" in diameter and one-inch long) in a lead barrel 9" in diameter and 9 inches high. This lead barrel has an opening in the center for storage and access of the source. The opening has a lockable cover over it. The source is removed from the lead container and placed inside the 1-1/2 inch source holder, AUX-8618, which is screwed onto the probe assembly. Source handling from the container to the holder is done by using 12 inch mechanical fingers (see sketch 41). Vehicle storage of sources will be used and the expected radiation level at the vehicle nearest the source is less than 2 MR/hr. These sources are constantly attended or locked to prevent access by unauthorized personnel.

The Troxler AM/BE (10MC) sources are stored inside the instrument in a polyethylene shield. The 1.85 inch X 10.5 inch probe is attached to a 12 ft. cable lead. The probe will be kept in the shield when not in use. The shipping case (instrument) is in accordance with DOT 7A, Type A, White 1 Label, registering 1.1 MR/hr, neutron and 0.15 MR/hr, gamma, dose rate at the surface. This source will be handled using the same procedures and care as the 3 curie AM/BE Neutron source above.

The Cesium 137 (250 mci) source is encapsulated as part of the probe. The source and shield, provided by Comprobe Inc., is certified by the International Atomic Energy Agency (reference GB/23/S) further described in drawings and specifications 3RC 11101/S, dated 21 March 1979. This shield, holding the source section of the probe, is bolted to the floor. The lid secures the source in place and is padlocked.

Item 9 NRC Form 313 Facilities & Equipment Cont.

The AM-BE and Co^{60} source holders are standard Gerhart-Owen, Model AUX-8618, sealed source holders for geophysical logging. (See enclosed drawing). The physical description is: the holder is approximately 10 inches long and 1-1/2 inches in diameter, made of stainless steel of sufficient wall thickness to withstand pressures many times the capacity of the logger. The holder unscrews in the middle, using double "O" rings to seal out fluid. This gives access to the sealed source, which is threaded into the inside of the source holder.

The storage containers for the AM-BE sealed sources are large steel containers. These containers are mounted insides the well logger van and are constantly attended or locked to prevent entry into the storage area of the containers. These containers are marked with labels in accordance with regulations 20.203, standards for Protection Against Radiation.

The Troxler AM/BE sources are stainless steel doubly encapsulated sources inside a 1.85 inch diameter by 10.5 inches long probe employing polyethylene shielding in the self-contained instrument.

Diagram - Item 9

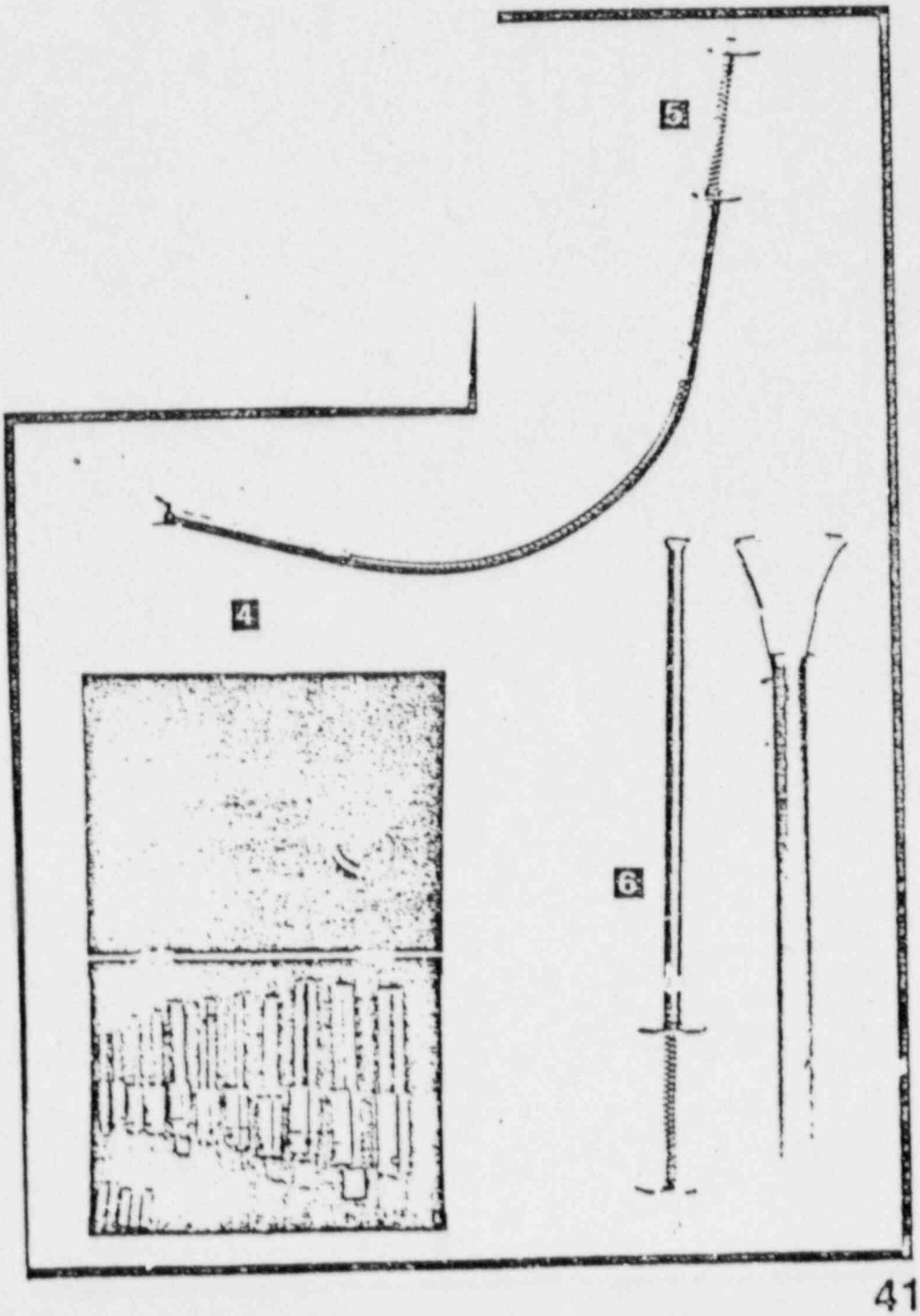
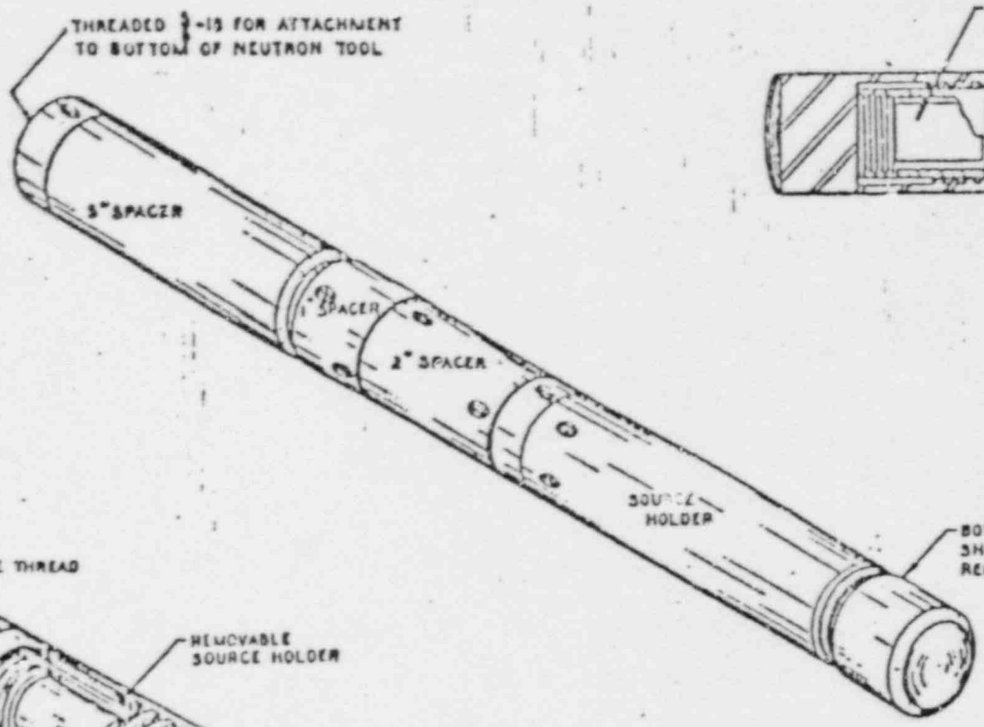
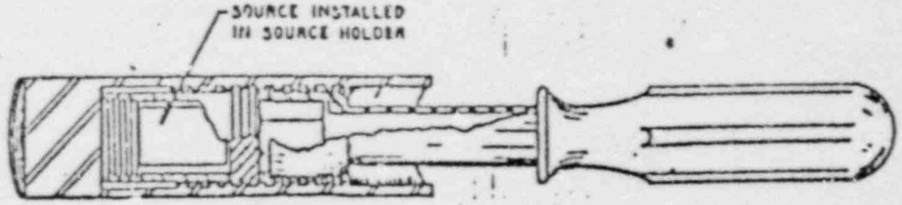


Diagram - Item 9



STAINLESS STEEL SOURCE HOLDER



3/4" SOCKET WRENCH SOURCE INSERTING TOOL

REVISIONS	DATE

DESCRIPTION: 1½" SOURCE HOLDER AND SPACER SHIELDS

USED ON ASSY. #: FOR NEUTRON LOGGING ATTACHMENT

MATERIAL:

TOLERANCE UNLESS NOTED ± 1/64 ± .005 | J. BRYAN | DATE 8-10-71

WELL RECONNAISSANCE, INC.
DALLAS, TEXAS

W.O. | DATE

CONTRACT

CHKD. BY | DATE

Item 10 NRC Form 313 Lic. No. 30-16251-01

Standard Operating Procedures

1. All personnel must have a TLD badge, worn in the front or carried in the front pocket, except visitors and temporary assistants, and they must maintain a distance of 50 feet or more during exposure of any radioactive source.

2. One copy of 10 CFR part 19 and part 20; one copy of the material license and a copy of the current radiation survey meter calibration, will be on file in the logging vehicle. The file will also contain sufficient copies of the Physical Survey form and a copy of the Shipper's Certification for Radioactive Material.

3. One copy of NRC-3 (notice to employees) will be posted on the wall inside the operator's compartment.

4. Sealed sources will not be removed from the source holders. No drilling or altering of sources or source holders will be attempted.

5. The vehicle source compartment will be locked, at all times, during transit.

6. Source containers must be bolted to the floor of the vehicle source compartment and kept locked during transit.

7. Source containers will be labeled with the proper and legible labels, showing the radioactive element, number of curies or millicuries, and the expected dose rate at three feet from the surface of the containers. Radioactive Material label criteria is as follows:

Dose Rate Limits

"Radioactive - White I"	.5 MR/hr at surface	0 MR/hr from 3ft.
"Radioactive - Yellow II"	50 MR/hr "	1.0 MR/hr
"Radioactive - Yellow III*	200 MR/hr	10 MR/hr

*Requires vehicle placarding

8. When the vehicle is used for storage of radioactive sources, such as over-night stops, and unrestricted parking areas, the vehicle will be posted with "Caution-Radioactive Material" signs. The vehicle must be locked or attended at all times. The source containers are also kept locked during storage.

Standard Operating Procedures

9. A semi-annual inspection of all the logging equipment, including the vehicle, will be performed by the Logging Supervisor or the Radiation Safety Officer. The check list of inspection points will be completed, noting and defective equipment and corrective action taken. The inspection sheets will be kept in the R.S.O. file for a period of three years or more.

10. A "Shippers Certification for Radioactive Material" will be completed, listing each source in-transit, and kept in the filing cabinet in the logger. A duplicate copy will be posted in the operator's compartment.

11. Before moving the vehicle to the job site, the radiation survey meter will be checked for operation. This operational check will be made in the driver-passenger area, and at the same time, making sure the area exposure rate is below 2 MR/hr.

Receiving and Shipping Radioactive Material

Packages containing radioactive material should be picked up expeditiously upon receipt of notification from the carrier of its arrival.

1. The radiation Safety Officer must authorize each order for radioactive sources and material and ensure that quantities are authorized by the license and within the possession limits.

2. The delivery firm should be known and notified of expected shipments. Arrangements will be made for pick-up or delivery immediately upon arrival. Only the logging supervisors, the radiation safety officer or management, listed on the license, are authorized to receive or package for shipment, radioactive material.

3. Each package must be visually inspected for signs of damage and the package surface monitored to assure that the exposure rate agrees with the package label. Radiation levels, at three feet from the external surface of the package, should not exceed 10 millirems per hour or 200 millirems per hour on the surface. Instructions of notification covered in paragraph 20.205(c) of 10 CFR part 20 will be followed in the event of excessive levels of radiation.

4. Packing slips will be compared with the contents and the order to verify agreement.

5. Protective gloves will be worn to prevent hand contamination when opening the package.

6. If licensed material is picked up at the supplier or delivered to the job site. The same precautions listed above will be followed.

7. If the package shows signs of damage and the survey meter indicates a reading in excess of 10 millirems at a distance of three feet, the package will be isolated in a restricted area and instructions of notification covered on item 3 will be implemented.

8. Radioactive liquid tracer materials are not included in this license and will not be used.

Standard Operating Procedures at the Job Site

Before commencing any logging operations, the logging supervisor should inquire about the hole conditions. If the day-to-day drilling activity indicates a caving problem or if the hole is uncased, tools without radioactive sources will be run first. If these tools are not retrieved freely, then no radioactive sources will be run until the hole in cased.

An acceptable alternative to casing the hole is to lower the drill stem past the caving section; pump fluid through it to clear the stem and run the radiation probe without the source attached. If no problems are encountered, then logging may continue.

A well owner or operator agreement must be signed prior to any well logging involving a radioactive source, as provided in 10 CFR part 39, paragraph 39.15.

Wells owned by the U.S. Government or Government affiliation need no agreement. A blanket agreement with frequent customers may be used.

1. Before removing any source for use, take the radiation survey at the points indicated on the "Physical Survey" form, and record the readings in the "Before" logging column. Inspect source containers, shields, source handling tools, "O"-rings, and threads to the logging tools. Any defects will be corrected, before use, or removed from service and reported to management. Any maintenance necessary or performed will be noted on the "Physical Survey" form, with the date of inspection, name of inspector, equipment involved, defects found, and repairs made.

2. Remove the old "Physical Survey" form from the logger wall, file it, and post the new form.

3. Check the complete logging system for operation before removing any radioactive source, by holding the source detector section of the radiation probe near the source container. Note the count-rate recorded by the logger. This gives a final check on the status of the source and the logging equipment; that is, a very high count rate would indicate that extra precaution should be taken to insure that the source is not damaged and a very low count rate would indicate that the logging equipment is not functioning properly. Either condition should be rectified before completing the probe assembly.

4. When "making up" the logging probes, remove the source from the storage container as the last step. The remote handling tools must be used when manipulating the source from the container to the logging tools. Carry the logging probes with the source section away from the body. After logging, remove the source immediately and put it back in the storage container and lock it.

5. During the time when any source is exposed, from the storage container or from the well, unauthorized people will maintain a distance of at least 50 feet from the source area.

6. Before leaving the location, complete the "Physical Survey" form by taking radiation survey readings at the observation points; recording the readings in the "after" logging column and indicate the sources used by a check mark in the "used this date" column.

7. A semi-annual management review will be conducted covering all the items listed on the review form. Any deficiencies noted, during the inspection, will be corrected and so indicated on the inspection form.

Management Review

Date:

Records inspected

1. Utilization (Physical Survey)
2. Source inventory
3. Personnel exposure
4. Leak test
5. Survey instrument calibration
6. Training Current
7. Standard Operator & Emergency Proc.

Vehicle inspected

1. NRC-3 (notice to employees) posted
2. Physical survey forms
3. Copy CFR part 19 and part 20 (one copy)
4. Survey instrument calib. current
5. Copy of NRC License
6. Area posted with Danger (or Caution) Radioactive
7. Source containers labeled
8. Source locked
9. Source containers secure against shifting during transit
10. Source holders, logging tools, handling tools, and containers in good condition.

Safety Program

1. Each person listed on license has 1 copy of Standard Operation and Emergency Procedures
2. Safety precaution procedures in effect and used
3. Personnel monitoring badge for each operator

Item 10 NRC Form 313 Lic. No. 30-16251-01

Standard Operating Procedures at the Job Site

STANDARD OPERATING PROCEDURES FOR TROXLER GAUGE

1. Before removing the Troxler instrument from storage, the PNC-4 neutron meter should be turned on and placed on the closed instrument lid. Allow at least five minutes warm-up for the meter before taking the reading. This reading will be done by one of the licensed operators and the reading recorded, with the date of reading, in the Troxler log book. The current PNC-4 reading should be compared with previous readings recorded in the Troxler log book. Emergency procedures will be initiated if any large deviations from the normal reading is noted.

2. Film badges will be worn by authorized users.

3. Maintenance on the gauge involving dismantling or removal of the source holder must not be performed by the user.

Transporting and Instrument

1. The instrument should be loaded, transported, and unloaded in a manner to minimize rough handling and bouncing around.

2. During transporting, the instrument will be attended at all time or secured by locking insides the vehicle.

At the Job Site

1. Turn the POWER/TIME switch to slow and the DISPLAY switch to STD COUNT, after a 10-minute warm up period. Record the standard count, date, and area of use of the physical survey sheet.

2. Record the date and standard count on the standard count log book which is kept in the instrument case. Compare this reading to the average of the previous four readings. A sudden shift or more than 1.5 percent indicates abnormality in gauge operation or procedure.

Radiation Safety Program

During normal logging operations only those authorized personnel with film badges should handle the sources or be near them. Logging supervisors and assistants will be instructed in the use of remote handling tools and the Standard Operating Procedures will be followed.

One copy of NRC-3 (Notice to Employees) will be posted on the logger wall at all times.

One copy of Part 19 and Part 20, NRC, Standards for Protection Against Radiation will be kept in the logger.

Source leak tests shall be performed by Eberline Instruments Inc. every six months.

Eberline Instrument Inc. supplies the dosimetry service, which includes TLD badges for monitoring neutron exposure of the whole body. These badges are serviced by Eberline quarterly. Eberline maintains exposure records which includes: accumulated dose for calendar quarter and calendar year, permissible whole body dose for calendar quarter and calendar year and life-time occupational dose. Copies of the exposure record are up-dated and mailed to the RSO after each badge reading. These exposure records contain all the information requested on NRC form 5 and are used in lieu of the form.

A operable and calibrated radiation survey meter, capable of detecting beta or gamma radiation, from low level (0.1 MR/hr) to at least 50 MR/hr will be maintained in the logging truck. This meter or meters will be calibrated, by Eberline Corp, or other certified instrument service companies, at intervals not to exceed 6 months.

Radiation meters, owned by the U.S. Geological Survey
(No second party meters)

Type/Model, (No.)	Detection	Range	Use
Eberline PNC-4(2)	Neutron Counter	0-500K CPM	Monitor/Survey
Victoreen 490(1)	Beta-Gamma	0-200MR/HR	do

When the sources are in their container shields, as in transit or storage, the expected radiation level is below 2 mr/hr at the nearest accessible point, and seven consecutive days of exposure in the area would result in less than 100 millirem dose. TLD exposure records indicate that whole body doses would not exceed 0.5 rem for any period of one calender year.

Radiation Safety Program Cont.

"Caution-Radiation Area" signs will be posted on both sides of the logging vehicle when the source area of the logging van is open. The source containers will be marked with "Caution-Radioactive Material" Signs. The source area will be kept locked at all times, when not in use. The source containers will be marked with the radiation level three feet from the surface of the container, the contents, construction and accident reporting procedures in accordance with DOT regulation. Source containers will be secured in the vehicle during transporting in order to satisfy requirements of 10 CFR part 71 of the commission's regulations.

Management review of the established radiation safety program will be conducted every six months and shall include but not be limited to the following: personnel exposure records, leak test records, survey meter calibrations and survey-utilization records, source inventory and disposal records, and inspection of the vehicle-storage facilities.

In addition to the Management review of operations and records, a annual inspection will be conducted by the R.S.O., in order to evaluate the overall safety program as applied to daily operations. The Annual Inspection Checklist will be completed during actual logging operations, unannounced.

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Annual Inspection Checklist

Well Logging location_____Date_____

Logging Supervisor_____

Radioisotopes used_____Activity_____

_____ _____

_____ _____

Survey Meter Model No._____Serial No._____

Calibration due date_____

1. Were all individuals working within the restricted area wearing TLD badges?

2. Was the restricted area properly controlled to prevent unauthorized entry?

3. Did the logging supervisor have a calibrated and properly operating survey meter and evidence of its latest calibration?

4. Was the Physical Survey and Utilization log properly filled out?

5. Were the shipping papers for transportation of radioactive material available and properly completed?

6. Was the logging supervisor working with defective equipment?

7. Were radioactive sources stored properly and kept secure to prevent unauthorized removal?

8. Was the storage area posted with "CAUTION (or DANGER) RADIOACTIVE MATERIAL" signs?

9. Did the logging supervisor possess a copy of the operating and emergency procedures?

10. Was a copy of the current NRC license available?

11. Were there any incidents which may have required initiation of emergency procedures?

12. If so, were the emergency procedures properly followed?

13. If necessary in the emergency, were surveys required by paragraphs 39.67(d) and 39.69(c) conducted and recorded?

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

Semi-Annual Inspection and Maintenance

Inspector:_____Date:_____

Check each piece of equipment and mark either good or defective under "Condition" column". Indicate "Corrective Action" taken, using the "Remarks" section for a move complete description, if necessary.

Equipment	Condition		Corrective Action		
	Good	Defect	Repaired	Replaced	Removed
Logging tools					
"O" rings					
Threads					
Source handling tools					
Storage Containers					
Source holders					
Cable head connection					
Cable Sheaves					
Vehicle:					
Tires					
Brakes					
Lights					
Steering					
Windshield and wipers					

Remarks:

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Duties of the Radiation Safety Officer

1. Development and enforcement of listed operating policies, emergency procedures and assistance in personnel training and orientation.

2. Verification of all purchases of radioactive material for compliance with possession limits of the license.

3. Maintenance of records such as personnel exposure records, logs of source and material usage, survey records, and waste disposal records.

4. Supervision of leak testing of sealed sources and instrument calibration, and maintenance of those records.

5. Provide advice and help for accidents and emergencies.

6. Maintenance of supplies such as radiation survey instruments, radiation signs, labels, and warning tape, forms and dosimeters.

7. Conduct radiation safety audits of licensed activities periodically to assure compliance with the regulation and license conditions.

8. Radioactive material received will be monitored with the radiation meter, before opening, to insure limits set forth by the radiation label are met. A swipe test of the source will be completed immediately.

9. Maintain a semiannual physical inventory of all material possessed.

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Emergency Procedures

In the event that a source is hung in the drill hole and cannot be recovered without danger of breaking the cable, at least one of the following personnel shall be notified immediately: Jim D. Hudson (RSO), James A. Basler, R.K. Dewees, or Don Hart, (Management).

The RSO will immediately notify the well owner or operator and initiate a retrieval program. The circulating fluids from the well, if any, will be continuously monitored with a radiation detection device to check for contamination. If retrieval efforts are successful, a radiation survey meter shall be on site in order to monitor the source upon arrival at the surface. Only approved "fish" techniques will be attempted.

If retrieval efforts are not successful and the source is lost in the well, instructions set forth in NRC rules and regulations, 10 CFR part 20, paragraphs 20.403, 20.405 and part 30, paragraph 30.56, part 39, paragraph 39.77 will be followed.

In case of vehicle accident, fire, explosion, ruptured source, theft of source, or any similar emergency situation, notify the RSO or management personnel. If the incident involves a ruptured source or source container, releasing radioactive contamination which may by of concentration fitting the provisions listed under 20.403 or 10 CFR part 20, timely (either immediate or 24 hours) notification of the incident to the region IV, NRC office shall be made followed by a written report within 30 days as prescribed by 20.405. The address and telephone number is listed in appendix D, 10 CFR part 20.

If a sealed source is ruptured, of prime consideration is the confining of contamination to as small an area as possible and keeping personnel exposures to a minimum.

The following outline of general rules should be applied as a guideline, not as a substitute for common sense.

1. Any source of contamination should be considered as a potential radiological health emergency, including minor, as well as, major incidents.

2. Determine the boundaries of the contamination and seal off the area to newcomers.

3. Permit no one to leave the contaminated area without being monitored to demonstrate no contamination. An exception will be made in cases to prevent overdose.

Emergency Procedures Cont.

4. Remove contaminated clothing and place it in a receptacle designated for this purpose.

5. Open wounds exposed to the contamination, should be immediately flushed with water, preferably under a running tap. The flushed water should be trapped and properly disposed of. Wash all areas of the skin exposed to contamination with clean water.

6. Low level radiation meters will be used in order to ascertain decontamination of personnel first and equipment later.

If additional meters are needed, they will be leased from Eberline Corp.

7. If ingestion of radioactive material has occurred, competent medical advice shall be followed.

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Waste Management

Sealed sources, which are surplus to the needs of the program, will be disposed of by Nuclear Sources and Services, Houston, Texas; a commercial waste disposal service.

Any waste generated through decontamination process, will be concentrated and compacted, sealed in appropriate barrels, then shipped to the Denver Federal Center for disposal through a licensed waste disposal contractor. Documentation and classification will be in accordance with regulation part 61, "Licensing Requirements for Land Disposal of Radioactive Waste".

PHYSICAL SURVEY

Meter

PNC-4 Serial No. 3303

Victoreen Serial No. 2475

____ Curies _____

____ MC _____

Date _____

Location _____

Operator _____

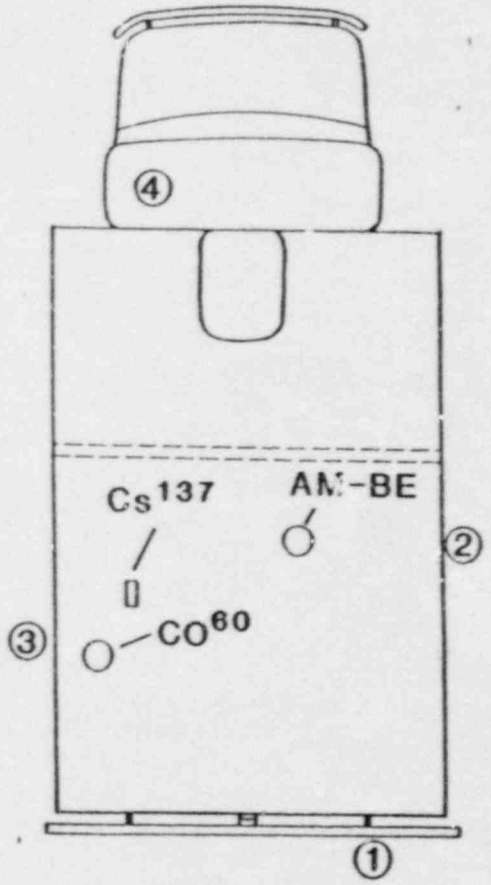
Observation point-Distance to Material

	Before	After
1. Immediate rear- approx. 7ft	_____	_____
2. Right Side-approx. 3ft.	_____	_____
3. Left Side-approx. 2ft.	_____	_____
4. Driver Seat-approx. 12 ft.	_____	_____

Inspected source containers-source holders-
handling tools-Logging tools-
Check O.K., or note deficienies at bottom

O.K. ☐

Strength/Type	Sources Model No.	Probe	Used this Date
3 CI AM-BE	T-355	Neutron	
10 MCI CO^{60}	S-865	Density	
250 MCI Cs^{137}	1996	D-Density	
250 MCI AM^{241}	T-277	HRD	



_____
Date

U.S. Geological Survey, Water Resources Division
4501 Indian School Rd., N.E., Suite 200
Pinetree Office Park
Albuquerque, New Mexico 87110

Dear Sir:

I understand that, if during a geophysical well-logging operation a nuclear source is irretrievably lost down my well, the well will be cemented and monumented as outlined in U.S. Nuclear Regulatory Commission Regulations 10 CFR, Part 39.15.

_____
Well Owner's Signature

_____
Well Location

_____
State

_____
County