

TITLE 32: ENERGY
CHAPTER II: ILLINOIS EMERGENCY MANAGEMENT AGENCY
SUBCHAPTER b: RADIATION PROTECTION

PART 351
RADIATION SAFETY REQUIREMENTS FOR WIRELINE
SERVICE OPERATIONS AND SUBSURFACE TRACER STUDIES

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SUBPART A: GENERAL PROVISIONS

Section 351.10 Purpose

This Part establishes requirements for the issuance of a license authorizing the use of licensed materials including sealed sources, radioactive tracers, radioactive markers, and uranium sinker bars in well logging in a single well. This Part also establishes radiation safety requirements for persons using licensed materials in these operations. The requirements of this Part are in addition to, and not in substitution for, the requirements of 32 Ill. Adm. Code: Chapter II, Subchapters b and d.

Section 351.20 Scope

This Part applies to all licensees or registrants who use sources of radiation for wireline service operations, including mineral logging, radioactive markers, or subsurface tracer studies.

Section 351.25 Incorporations by Reference

- a) All rules, standards, and guidelines of agencies of the United States or nationally recognized organizations or associations that are incorporated by reference in this Part are incorporated as of the date specified in the reference and do not include any later amendments or editions. Copies of these rules, standards, and guidelines that have been incorporated by reference are available for public inspection at the Illinois Emergency Management Agency, 1035 Outer Park Drive, Springfield, Illinois.
- b) Incorporated Materials
 - 1) "Classification of Sealed Radioactive Sources" (1968), Standard N5.10-1968, United States of America Standards Institute (USASI) (now American National Standards Institute (ANSI)), 1899 L Street, NW, 11th Floor, Washington, DC 20036; (202) 293-8020; <https://www.ansi.org>.
 - 2) "Consolidated Guidance About Materials Licenses: Program-Specific Guidance About Well Logging, Tracer, and Field Flood Study Licenses: Final Report" (2018), NUREG-1556, Vol. 14, Rev. 1, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; (800) 368-5642; available at <https://www.nrc.gov/docs/ML1812/ML18120A129.pdf>.
 - 3) "Sealed Radioactive Sources – Classification" (1997), Standard N43.6-1997, American National Standards Institute/Health Physics Society (ANSI/HPS), 1899 L Street, NW, 11th Floor, Washington, DC 20036; (202) 293-8020; <https://www.ansi.org>.

Section 351.30 Definitions

As used in this Part, the following definitions apply:

"Agency" means the Illinois Emergency Management Agency.

"Energy compensation source (ECS)" means a small sealed source, with an activity not exceeding 3.7 MBq (100 microcuries), used within a logging tool, or other tool components, to provide a reference standard to maintain the tool's

calibration when in use.

"Field station" means a facility where radiation sources may be stored or used and from which equipment is dispatched to temporary jobsites.

"Fresh water aquifer" means a geological formation that is capable of yielding fresh water to a well or spring.

"Injection tool" means a device used for controlled subsurface injection of radioactive tracer material.

"Irretrievable well logging source" means any sealed source containing radioactive material that is pulled off or not connected to the wireline that suspends the source in the well and for which all reasonable effort at recovery has been expended.

"Logging assistant" means any individual who, under the personal supervision of a logging supervisor, handles sealed sources or tracers that are not in logging tools or shipping containers or who performs surveys required by Section 351.670.

"Logging supervisor" means an individual who uses licensed material or provides personal supervision in the use of licensed material at a temporary jobsite and who is responsible to the licensee for assuring compliance with the requirements of the Agency's regulations and the conditions of the license.

"Logging tool" means a device used subsurface to perform well logging.

"Mineral logging" means any logging performed for the purpose of mineral exploration other than oil or gas.

"Personal supervision" means guidance and instruction by a logging supervisor, who is physically present at a temporary jobsite, who is in personal contact with logging assistants, and who can give immediate assistance.

"Radioactive marker" means licensed material used for depth determination or direction orientation. For purposes of this Part, this term includes radioactive collar markers and radioactive iron nails.

"Safety review" means a periodic review provided by the licensee for its employees on radiation safety aspects of well logging. The review may include, as appropriate, the results of internal inspections, new procedures or equipment, accidents or errors that have been observed, and opportunities for employees to ask safety questions.

"Source holder" means a housing or assembly into which a sealed source is placed to facilitate the handling and use of the source in well logging operations.

"Subsurface tracer study" means the release of unsealed licensed material or a substance labeled with licensed material in a single well for the purpose of tracing the movement or position of the material or substance in the well or adjacent formation.

"Surface casing for protecting fresh water aquifers" means a pipe or tube used as a lining in a well to isolate fresh water aquifers from the well.

"Temporary jobsite" means any location where licensed material is used or stored for 180 days or less during any consecutive 12 months, and not specifically listed on a radioactive material license.

"Tritium neutron generator target source" means a tritium (hydrogen-3) source used within a neutron generator tube to produce neutrons for use in well logging applications.

"Uranium sinker bar" means a weight containing depleted uranium used to pull a logging tool toward the bottom of a well.

"Well" means a drilled hole in which well logging may be performed. As used in this Part, "well" includes drilled holes for the purpose of disposal or oil, gas, mineral, groundwater, or geological exploration.

"Well-bore" means a drilled hole in which wireline service operations and subsurface tracer studies are performed.

"Well logging" means all operations involving the lowering and raising of measuring devices or tools which contain licensed material or are used to detect licensed materials in wells for the purpose of obtaining information about the well or adjacent formations which may be used in oil, gas, mineral, groundwater, or geological exploration.

"Wireline" means a cable containing one or more electrical conductors which is used to lower and raise logging tools in the well-bore.

"Wireline service operation" means any evaluation or mechanical service which is performed in the well-bore using devices on a wireline.

SUBPART B: SPECIFIC LICENSING REQUIREMENTS

Section 351.110 Application for a Specific License

A person, as defined in 32 Ill. Adm. Code 310.20, may apply for a specific license authorizing the use of licensed material in well logging. Applications shall be filed in accordance with 32 Ill. Adm. Code 330.240.

Section 351.130 Specific License for Well Logging

The Agency will approve an application for a specific radioactive material license in well logging if the applicant meets the following requirements:

- a) Complies with the general requirements specified in 32 Ill. Adm. Code 330.250.
- b) Develops and submits to the Agency a program for training logging supervisors and logging assistants which specifies the details of:
 - 1) Initial training;
 - 2) On-the-job training;
 - 3) Annual safety reviews to be provided by the licensee;
 - 4) The means the applicant will use to demonstrate the logging supervisor's knowledge and understanding of and ability to comply with the Agency's regulations and licensing requirements and the Applicant's operating and emergency procedures; and
 - 5) The means the applicant will use to demonstrate the logging assistant's knowledge and understanding of and ability to comply with the Agency's rules, license conditions, and the applicant's operating and emergency procedures.
- c) Submits written operating and emergency procedures as required in Section 351.630.
- d) Establishes and submits to the Agency a program for annual inspections of the job performance of each logging supervisor to ensure that the Agency's regulations, license conditions, and the applicant's operating and emergency procedures are followed. The applicant's annual inspection program shall include provisions to retain inspection records for 3 years after each annual internal inspection.

- e) Submits a description of the overall organizational structure as it applies to the radiation safety responsibilities in well logging and specifies delegations of authority and responsibility.
- f) If the Applicant intends to perform leak testing of sealed sources, establishes and submits to the Agency procedures for leak testing that include the following information:
 - 1) The instruments to be used;
 - 2) The methods of performing the analysis; and
 - 3) The pertinent experience of the person who will analyze the wipe samples.

Section 351.150 Agreement with Well Owner or Operator

- a) A licensee may perform well logging with a sealed source only after the licensee has a written agreement with the employing well owner or operator. This written agreement shall identify who will meet the following requirements:
 - 1) If a sealed source becomes lodged in the well, a reasonable effort will be made to recover it.
 - 2) A person may not attempt to recover a sealed source in a manner which, in the licensee's opinion, could result in its rupture.
 - 3) Radiation monitoring required in Section 351.690(a).
 - 4) If the environment, any equipment, or personnel are contaminated with licensed material, they must be decontaminated before release from the site or release for unrestricted use.
 - 5) If the sealed source is classified as irretrievable after reasonable efforts at recovery have been expended, the following requirements shall be implemented within 30 days:
 - A) Each irretrievable well logging source shall be immobilized and sealed in place with a cement plug;
 - B) A means to prevent inadvertent intrusion on the source shall be established unless the source is not accessible to any subsequent drilling operations; and

- C) A permanent identification plaque, constructed of long-lasting material such as stainless steel, brass, bronze, or monel, shall be mounted at the surface of the well unless the mounting of the plaque is not practical. The size of the plaque must be at least 17 cm (7 inches) square and 3 mm ($\frac{1}{8}$ inch) thick. The plaque shall contain:
- i) The word "CAUTION";
 - ii) The radiation symbol (the color requirement in 32 Ill. Adm. Code 340.910(a) need not be met);
 - iii) The date the source was abandoned;
 - iv) The name of the well owner or well operator, as appropriate;
 - v) The well name and well identification number or other designation;
 - vi) An identification of the sealed source by radionuclide and quantity;
 - vii) The depth of the source and depth to the top of the plug; and
 - viii) An appropriate warning, such as, "DO NOT RE-ENTER THIS WELL."
- b) The licensee shall retain a copy of the written agreement for 3 years after the completion of the well logging operation.
- c) A licensee may request Agency approval, on a case-by-case basis, of proposed procedures to abandon an irretrievable well logging source in a manner not otherwise authorized in subsection (a)(5).
- d) A written agreement between the licensee and the well owner or operator is not required if the licensee and the well owner or operator are part of the same corporate structure or otherwise similarly affiliated. However, the licensee shall still meet the requirements in subsections (a)(1) through (a)(5).

SUBPART C: EQUIPMENT

Section 351.310 Labels, Security, and Transportation Precautions

- a) Labels
 - 1) The licensee may not use a source, source holder, or logging tool that contains licensed material unless the smallest component that is transported as a separate piece of equipment with the licensed material inside bears a durable, legible, and clearly visible marking or label. The marking or label must contain the radiation symbol specified in 32 Ill. Adm. Code 340.910(a), without the conventional color requirements, and the wording "DANGER (or CAUTION) RADIOACTIVE MATERIAL."
 - 2) The licensee may not use a container to store licensed material unless the container has a securely attached label that is durable, legible, and clearly visible. The label must contain the radiation symbol specified in 32 Ill. Adm. Code 340.910(a) and the wording "CAUTION (or DANGER), RADIOACTIVE MATERIAL, NOTIFY CIVIL AUTHORITIES (or NAME OF COMPANY)."
 - 3) The licensee may not transport licensed material unless the material is packaged, labeled, marked, and accompanied with appropriate shipping papers pursuant to 32 Ill. Adm. Code 341.
- b) Security Precautions During Storage and Transportation
 - 1) The licensee shall store each source containing licensed material in a storage container or transportation package. The container or package shall be locked and physically secured to prevent tampering or removal of licensed material from storage by unauthorized personnel. The licensee shall store licensed material in a manner which will minimize danger from explosion or fire.
 - 2) The licensee shall lock and physically secure the transport package containing licensed material in the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal of the licensed material from the vehicle.

Section 351.330 Radiation Detection Instruments

- a) The licensee or registrant shall keep sufficient calibrated and operable radiation survey instruments at each field station and temporary jobsite to make physical radiation surveys as required by this Part and by 32 Ill. Adm. Code 340.510(a). Instrumentation shall be capable of measuring 0.001 mSv (0.1 mrem) per hour

through at least 0.5 mSv (50 mrem) per hour.

- b) The licensee shall have available additional calibrated and operable radiation detection instruments sensitive enough to detect the low radiation and contamination levels that could be encountered if a sealed source ruptured. The licensee may own the instruments or may have a procedure to obtain them quickly from a second party.
- c) The licensee must have each radiation survey instrument required under subsections (a) and (b) calibrated:
 - 1) At intervals not to exceed 6 months and after each instrument servicing (e.g., electronic repair);
 - 2) For linear scale instruments, at two points located approximately $\frac{1}{3}$ and $\frac{2}{3}$ of full-scale on each scale; for logarithmic scale instruments, at midrange of each decade, and at two points of at least one decade; and for digital instruments, at appropriate points; and
 - 3) So that accuracy within plus or minus 20 percent of the calibration standard can be demonstrated on each scale.
- d) The licensee shall retain calibration records for a period of 3 years after the date of calibration for inspection by the Agency.

Section 351.350 Leak Testing of Sealed Sources

- a) **Testing and Recordkeeping Requirements.** Each licensee who uses a sealed source shall have the source tested for leakage as described in subsection (c). The licensee shall keep a record of leak test results under 32 Ill. Adm. Code 340.1135.
- b) **Method of Testing.** The wipe of a sealed source shall be performed using a leak test kit or method approved by the Agency, the U.S. Nuclear Regulatory Commission, or an Agreement State. The wipe sample shall be taken from the nearest accessible point to the sealed source where contamination might accumulate. The wipe sample shall be analyzed for radioactive contamination. The analysis shall be capable of detecting the presence of 185 Bq (0.005 microcuries) of radioactive material on the test sample and shall be performed by a person approved by the Agency, the U.S. Nuclear Regulatory Commission, or an Agreement State to perform the analysis.
- c) **Test Frequency**

- 1) Each sealed source, except an energy compensation source (ECS), shall be tested at intervals not to exceed 6 months. In the absence of a certificate from a transferor that a test has been made within the 6 months before the transfer, the sealed source may not be used until tested.
 - 2) Each ECS that is not exempt from testing pursuant to subsection (e) shall be tested at intervals not to exceed 3 years. In the absence of a certificate from a transferor that a test has been made within the 3 years before the transfer, the ECS may not be used until tested.
- d) Removal of Leaking Source from Service
- 1) If the test conducted pursuant to subsections (a) and (b) reveals the presence of 185 Bq (0.005 microcuries) or more of removable radioactive material, the licensee shall remove the sealed source from service immediately and have it decontaminated, repaired, or disposed of by an Agency, U.S. Nuclear Regulatory Commission, or Agreement State licensee that is authorized to perform these functions. The licensee shall check the equipment associated with the leaking source for radioactive contamination and, if contaminated, have it decontaminated or disposed of by an Agency, U.S. Nuclear Regulatory Commission, or Agreement State licensee that is authorized to perform these functions.
 - 2) Reports of test results for leaking or contaminated sealed sources shall be made pursuant to 32 Ill. Adm. Code 340.1260.
- e) Exemptions from Testing Requirements. The following sealed sources are exempt from the periodic leak test requirements set out in subsections (a) through (d):
- 1) Hydrogen-3 (tritium) sources;
 - 2) Sources containing licensed material with a half-life of 30 days or less;
 - 3) Sealed sources containing licensed material in gaseous form;
 - 4) Sources of beta- or gamma-emitting radioactive material with an activity of 3.7 MBq (100 microcuries) or less; and
 - 5) Sources of alpha- or neutron-emitting radioactive material with an activity of 0.37 MBq (10 microcuries) or less.

Section 351.370 Quarterly Physical Inventory

Each licensee or registrant shall conduct a quarterly physical inventory to account for all sources of radiation. If all sources are not accounted for during the inventory, the licensee or registrant shall notify the Agency in accordance with the requirements of 32 Ill. Adm. Code 340.1210. Records of inventories shall be maintained for 3 years from the date of inventory for inspection by the Agency and shall include the quantities and kinds of sources of radiation, the location of the sources of radiation, the date of the inventory, and the name of the individual conducting the inventory. Physical inventory records may be combined with leak test records, as appropriate.

Section 351.390 Records of Use for Radioactive Material

- a) Each licensee or registrant shall maintain records for each use of licensed material, including:
 - 1) The make, model number, and a serial number or a description of each sealed source of radiation used;
 - 2) In the case of unsealed licensed material used for subsurface tracer studies, the radionuclide and quantity of activity used in a particular well and the disposition of any unused tracer materials;
 - 3) The identity of the logging supervisor who is responsible for the licensed material and the identity of logging assistants present; and
 - 4) The location and date of use of the licensed material.
- b) The licensee or registrant shall retain the use records for 3 years from the date of the recorded event and make them available for inspection by the Agency.

Section 351.410 Design and Performance Criteria for Sources

- a) A licensee may not use a sealed source in well logging unless:
 - 1) The sealed source is doubly encapsulated;
 - 2) The sealed source contains licensed material whose chemical and physical forms are as insoluble and non-dispersible as practical; and
 - 3) The sealed source meets the requirements of subsection (b), (c), or (d).
- b) For a sealed source manufactured on or before July 14, 1989, a licensee may use the sealed source in well logging applications only if it meets the requirements of the United States of America Standards Institute (USASI) N5.10-1968,

"Classification of Sealed Radioactive Sources", incorporated by reference in Section 351.25, or the requirements in subsection (c) or (d).

- c) For a sealed source manufactured after July 14, 1989, a licensee may use the sealed source in well logging applications if it meets the oil well logging requirements of the American National Standards Institute/Health Physics Society (ANSI/HPS) N43.6-1997, "Sealed Radioactive Sources – Classification."
- d) For a sealed source manufactured after July 14, 1989, a licensee may use the sealed source, for well logging applications only if a prototype of the sealed source has been tested and found to maintain its integrity after each of the following tests:
 - 1) Temperature. The test source was held at -40 °C for 20 minutes, 600 °C for 1 hour, and then subjected to a thermal shock test with a temperature drop from 600 °C to 20 °C within 15 seconds.
 - 2) Impact Test. A 5 kg steel hammer, 2.5 cm in diameter, was dropped from a height of 1 m onto the test source.
 - 3) Vibration Test. The test source was subjected to a vibration from 25 Hz to 500 Hz at an amplitude of 5 times the acceleration of gravity for 30 minutes.
 - 4) Puncture Test. A 1-gram hammer and pin, 0.3 cm pin diameter, was dropped from a height of 1 m onto the test source.
 - 5) Pressure Test. The test source was subjected to an external pressure of 16.95 MPascals (24,600 pounds per square inch absolute).
- e) The requirements of subsections (a), (b), (c), and (d) do not apply to sealed sources that contain licensed material in gaseous form.
- f) The requirements of subsections (a), (b), (c), and (d) do not apply to energy compensation sources (ECSs). ECSs shall be registered with the Agency, the U.S. Nuclear Regulatory Commission, or another Agreement State pursuant to the equivalent of 32 Ill. Adm. Code 330.280(m)(2) and 10 CFR 32.210.

Section 351.430 Inspection, Maintenance, and Opening of a Sealed Source or Source Holder

- a) Each licensee or registrant shall visually check source holders, logging tools, and source handling tools for defects before each use to ensure that the equipment is

in good working condition and required labeling is present. If defects are found, the equipment shall be removed from service until repaired and a record must be made listing the date of the check, name of the inspector, equipment involved, defects found, and repairs made. Records shall be retained for 3 years after the defect is found.

- b) Each licensee or registrant shall have a program for semiannual visual inspection and routine maintenance of source holders, logging tools, injection tools, source handling tools, storage containers, transport containers, and uranium sinker bars to ensure that the required labeling is legible and no physical damage is visible. If defects are found, the equipment shall be removed from service until repaired and a record made listing the date, equipment involved, inspection and maintenance operations performed, any defects found, and any actions taken to correct the defects. Records shall be retained for 3 years after the defect is found.
- c) Removal of a sealed source from a source holder or logging tool and maintenance on sealed sources or holders in which sealed sources are contained may not be performed by the licensee unless a written procedure developed pursuant to Section 351.630 has been approved by the Agency pursuant to Section 351.130(c) or by the U.S. Nuclear Regulatory Commission or an Agreement State.
- d) If a sealed source is stuck in the source holder, the licensee may not perform any operation, such as drilling, cutting, or chiseling, on the source holder unless the licensee is specifically approved by the Agency, the U.S. Nuclear Regulatory Commission, or an Agreement State to perform this operation.
- e) The repair, opening, or modification of any sealed source shall be performed only by persons specifically authorized to do so by the Agency, the U.S. Nuclear Regulatory Commission, or an Agreement State.

Section 351.450 Subsurface Tracer Studies

- a) All personnel handling radioactive tracer material shall be required to use protective gloves and, if required by the license, other protective clothing and equipment. Precautions shall be taken by the licensee to avoid ingestion or inhalation of radioactive tracer material and to avoid contamination of field stations and temporary jobsites.
- b) A licensee may not knowingly inject licensed material into fresh water aquifers without specific license authorization issued by the Agency pursuant to 32 Ill. Adm. Code 330.250. The authorization will be issued only if the Applicant's proposed procedures will:

- 1) Prevent tracer concentrations at the most exposed drinking water source or public water supply inlet from exceeding the Illinois Pollution Control Board's maximum contaminant levels for radionuclides in 35 Ill. Adm. Code 611.330; and
- 2) Be performed:
 - A) On an underground injection well for which a U.S. Environmental Protection Agency underground injection control program permit has been issued pursuant to 40 CFR 124 or 40 CFR 144, 35 Ill. Adm. Code 705, or 62 Ill. Adm. Code 240; or
 - B) On a well for which the Illinois Department of Natural Resources has approved a subsurface radioactive tracer study pursuant to 62 Ill. Adm. Code 240.

Section 351.470 Radioactive Markers

A licensee or registrant may use radioactive markers in wells only if the individual markers contain quantities of licensed material not exceeding the quantities specified in Appendix B of 32 Ill. Adm. Code Part 330. The use of markers is subject only to the requirements of Section 351.370.

Section 351.490 Uranium Sinker Bars

A licensee or registrant may use a uranium sinker bar in well logging applications only if it is legibly impressed with the words "CAUTION--RADIOACTIVE--DEPLETED URANIUM" and "NOTIFY CIVIL AUTHORITIES (or COMPANY NAME) IF FOUND."

Section 351.510 Use of a Sealed Source in a Well Without Surface Casing

The licensee may use a sealed source in a well without a surface casing for protecting fresh water aquifers only if the licensee follows a procedure for reducing the probability of the sealed source becoming lodged in the well. The procedure shall be approved by the Agency pursuant to Section 351.130(c) or by the U.S. Nuclear Regulatory Commission or an Agreement State.

Section 351.530 Energy Compensation Source (ECS)

- a) The licensee may use an ECS that is contained within a logging tool, or other tool components only if the ECS contains quantities of licensed material not exceeding 3.7 MBq (100 microCi).

- b) For well logging applications with a surface casing for protecting fresh water aquifers, use of the ECS is only subject to the requirements of Sections 351.350, 351.370, and 351.390.
- c) For well logging applications without a surface casing for protecting fresh water aquifers, use of the ECS is subject to the requirements of Sections 351.150, 351.350, 351.370, 351.390, 351.510, and 351.770.

Section 351.550 Tritium Neutron Generator Target Source

- a) Use of a tritium neutron generator target source, containing quantities not exceeding 1,110 GBq (30 Ci) in a well with a surface casing to protect fresh water aquifers, is subject to the requirements of this Part except Sections 351.150, 351.410, and 351.770.
- b) Either use of a tritium neutron generator target source containing quantities exceeding 1,110 GBq (30 Ci) or in a well without a surface casing to protect fresh water aquifers is subject to the requirements of this Part, except Section 351.410.

SUBPART D: RADIATION SAFETY REQUIREMENTS

Section 351.610 Training

- a) No licensee or registrant shall permit any individual to act as a logging supervisor as defined in this Part until the individual has:
 - 1) Completed 24 hours of training in the subjects outlined in Section 351.Appendix A;
 - 2) Read and received instruction in the regulations contained in this Part and the applicable Sections of 32 Ill. Adm. Code 310, 340, and 400; the license under which the logging supervisor will perform well logging; and the licensee's or registrant's operating and emergency procedures required by Section 351.630;
 - 3) Completed on-the-job training and demonstrated competence in the use of licensed materials, remote handling tools, and radiation survey instruments by a field evaluation; and
 - 4) Demonstrated understanding of the requirements in subsections (a)(1) and (2) by successfully completing a written exam.
- b) No licensee or registrant shall permit any individual to act as a logging assistant

until the individual has:

- 1) Received instruction in the applicable Sections of 32 Ill. Adm. Code 340 and 400;
 - 2) Received copies of, and instruction in, the licensee's operating and emergency procedures required by Section 351.630;
 - 3) Demonstrated understanding of the materials listed in subsections (b)(1) and (2) by successfully completing a written or oral exam; and
 - 4) Received instruction in the use of licensed material, remote handling tools, and radiation survey instruments, as appropriate for the logging assistant's intended job responsibilities.
- c) The licensee or registrant shall provide safety reviews for logging supervisors and logging assistants at least once during each calendar year.
- d) The licensee or registrant shall maintain a record of each logging supervisor's and logging assistant's training and annual safety review. The training records shall include copies of written tests and dates of oral tests given after July 14, 1987. The training records shall be retained until 3 years following the termination of employment. Records of annual safety reviews shall list the topics discussed and be retained for 3 years.

Section 351.630 Operating and Emergency Procedures

Each licensee or registrant shall develop and follow written operating and emergency procedures that cover at least the following:

- a) Handling and use of licensed material, including the use of sealed sources in wells without a surface casing for protecting fresh water aquifers, if appropriate;
- b) The use of remote handling tools for handling sealed sources and radioactive tracer material except for low-activity calibration sources;
- c) Methods and occasions for conducting radiation surveys, including surveys for detecting contamination as required by Sections 351.670(c) through (e);
- d) Minimizing personnel exposure, including exposures from inhalation and ingestion of licensed tracer materials;
- e) Methods and occasions for locking and securing stored licensed material;

- f) Personnel monitoring and the use of personnel monitoring equipment;
- g) Transportation of licensed materials to field stations or temporary jobsites, packaging of licensed materials for transport in vehicles, placarding of vehicles when needed, and physically securing licensed materials in transport vehicles during transportation to prevent accidental loss, tampering, or unauthorized removal;
- h) Picking up, receiving, and opening packages containing licensed material, in accordance with 32 Ill. Adm. Code 340.960;
- i) For the use of tracers, decontamination of the environment, equipment, and personnel;
- j) Maintenance of records generated by logging personnel at temporary jobsites;
- k) Inspection and maintenance of sealed sources, source holders, logging tools, injection tools, source handling tools, storage containers, transport containers, and uranium sinker bars as required by Section 351.430;
- l) Identifying and reporting to the Agency defects and noncompliance as required by 32 Ill. Adm. Code 340;
- m) Actions to be taken if a sealed source is lodged in a well;
- n) Procedure for notifying proper personnel in the event of an accident; and
- o) Actions to be taken if a sealed source is ruptured, including actions to prevent the spread of contamination, minimize the inhalation and ingestion of licensed material, and obtain suitable radiation survey instruments as required by Section 351.330(b).

Section 351.650 Personnel Monitoring

- a) No licensee or registrant shall permit any individual to act as a logging supervisor or logging assistant unless each individual wears an individual monitoring device (i.e., personnel dosimeter) at all times during the handling of licensed radioactive material. Each personnel dosimeter shall be assigned to and worn by only one individual. Film badges shall be replaced at least monthly and all other personnel dosimeters that require replacement shall be replaced at least quarterly. All personnel dosimeters shall be evaluated at least quarterly or promptly after replacement, whichever is more frequent.

- b) The licensee shall provide bioassay services to individuals using licensed materials in subsurface tracer studies if required by the license.
- c) The licensee shall retain records of personnel dosimeters required by subsection (a) and bioassay results in accordance with 32 Ill. Adm. Code 340.1160.

Section 351.670 Radiation Surveys

- a) The licensee shall make radiation surveys, including but not limited to the surveys required under subsections (b) through (e), of each area where licensed material is used and stored.
- b) Before transporting licensed material, the licensee shall make a radiation survey of the position occupied by each person in the vehicle and of the exterior of each vehicle used to transport the licensed material. The surveys and calculations shall include each source of radiation or combination of sources to be transported in the vehicle.
- c) If the sealed source assembly is removed from the logging tool before departure from the temporary jobsite, the licensee shall confirm that the logging tool is free of contamination by energizing the logging tool detector or by using a survey meter.
- d) If the licensee has reason to believe that, as a result of any operation involving a sealed source, the encapsulation of the sealed source could be damaged by the operation, the licensee shall conduct a radiation survey, including a contamination survey, during and after the operation.
- e) The licensee shall make a radiation survey at the temporary jobsite before and after each subsurface tracer study to confirm the absence of contamination.
- f) The results of the radiation surveys required under subsections (a) through (e) must be recorded and shall include the date of the survey, the names of the individuals making the survey, the identification of the survey instruments used, and an exact description of the location of the survey. The licensee shall retain records of these radiation surveys for inspection by the Agency for 5 years after completion of the survey.

Section 351.690 Radioactive Contamination Control

- a) If the licensee detects evidence that a sealed source has ruptured or licensed material has caused contamination, the licensee shall immediately initiate the

emergency procedures required by Section 351.630.

- b) If contamination results from the use of licensed material in well logging, the licensee shall decontaminate all work areas, equipment, and unrestricted areas.
- c) During efforts to recover a sealed source lodged in the well, the licensee shall continuously monitor, with an appropriate radiation detection instrument or a logging tool with a radiation detector, the circulating fluids from the well, if any, to check for contamination resulting from damage to the sealed source.

Section 351.695 Particle Accelerators

No licensee or registrant shall 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 32 Ill. Adm. Code 340.210 and 340.310, as applicable, are met.

SUBPART E: SECURITY, RECORDS, NOTIFICATIONS

Section 351.710 Security

- a) A logging supervisor shall be physically present at a temporary jobsite whenever licensed materials are being handled or are not stored and locked in a vehicle or storage place. The logging supervisor may leave the jobsite to obtain assistance if a source becomes lodged in a well and another logging supervisor or logging assistant trained under this Part has been designated to provide oversight.
- b) During well logging, except when radiation sources are below ground or in shipping or storage containers, the logging supervisor or other individual designated by the logging supervisor shall maintain direct surveillance of the operation to prevent unauthorized entry into a restricted area, as defined in 32 Ill. Adm. Code 310.

Section 351.730 Documents and Records Required at Field Stations

Each licensee or registrant shall maintain, for inspection by the Agency, the following documents and records for the specific devices and sources used at the field station:

- a) A copy of this Part and 32 Ill. Adm. Code 340 and 400;
- b) A copy of the license or certificate of registration, as applicable;
- c) Operating and emergency procedures required by Section 351.630;

- d) Records of the latest survey instrument calibrations required by Section 351.330;
- e) The record of leak test results required by Section 351.350, including the dates they were performed on the sealed sources and the test results;
- f) Physical inventory records required by Section 351.370;
- g) Use records required by Section 351.390;
- h) Records of inspection and maintenance required by Section 351.430;
- i) Training records required by Section 351.610(d); and
- j) Radiation survey records required by Section 351.670.

Section 351.750 Documents and Records Required at Temporary Jobsites

Each licensee or registrant conducting operations at a temporary jobsite shall have the following documents and records available at that site for inspection by the Agency:

- a) Operating and emergency procedures required by Section 351.630;
- b) Evidence of the most recent calibration of the radiation survey instruments in use at the jobsite as required by Section 351.330;
- c) The latest radiation survey records required by Section 351.670(b), (c), and (e) for the period of operation at the site;
- d) The shipping papers for the transportation of radioactive material required by 32 Ill. Adm. Code 341;
- e) When operating in the State under reciprocity as provided for in 32 Ill. Adm. Code 330.900, a copy of the appropriate license, certificate of registration, or equivalent documents authorizing the use of licensed material;
- f) The dates and results of the most recent tests for leakage or contamination performed on the sealed sources; and
- g) A copy of the licensee's radioactive material license, including all appropriate amendments.

Section 351.770 Notification of Incidents and Lost Sources; Abandonment Procedures for

Irretrievable Sources

- a) The licensee shall immediately notify the Agency by telephone and, subsequently within 30 days, by confirmation in writing, using an appropriate method listed in 32 Ill. Adm. Code 310.110, if the licensee knows or has reason to believe that a sealed source has been ruptured. The written confirmation shall designate the well or other location, describe the magnitude and extent of the escape of licensed material, assess the consequences of the rupture, and explain efforts planned or being taken to mitigate these consequences.
- b) The licensee shall notify the Agency of the theft or loss of radioactive material, radiation overexposures, excessive levels and concentrations of radiation, and certain other accidents as required by 32 Ill. Adm. Code 340.1205, 340.1210, 340.1220, and 340.1230.
- c) If a sealed source becomes lodged in a well, and when it becomes apparent that efforts to recover the sealed source will not be successful, the licensee shall:
 - 1) Notify the Agency by telephone at (217) 782-7860 of the circumstances that resulted in the inability to retrieve the source and:
 - A) Obtain Agency approval to implement abandonment procedures;
or
 - B) Explain that the licensee implemented abandonment procedures before receiving Agency approval because the licensee believed there was an immediate threat to public health and safety;
 - 2) Advise the well owner or operator, as appropriate, of the abandonment procedures under subsection 351.150(a) or (c); and
 - 3) Either ensure that abandonment procedures are implemented within 30 days after the sealed source has been classified as irretrievable or request an extension of time if unable to complete the abandonment procedures.
- d) The licensee shall, within 30 days after a sealed source has been classified as irretrievable, make a report in writing to the Agency. The licensee shall send a copy of the report to each appropriate State or federal agency that issued permits or otherwise approved of the drilling operation. The report shall contain the following information:
 - 1) Date of occurrence;

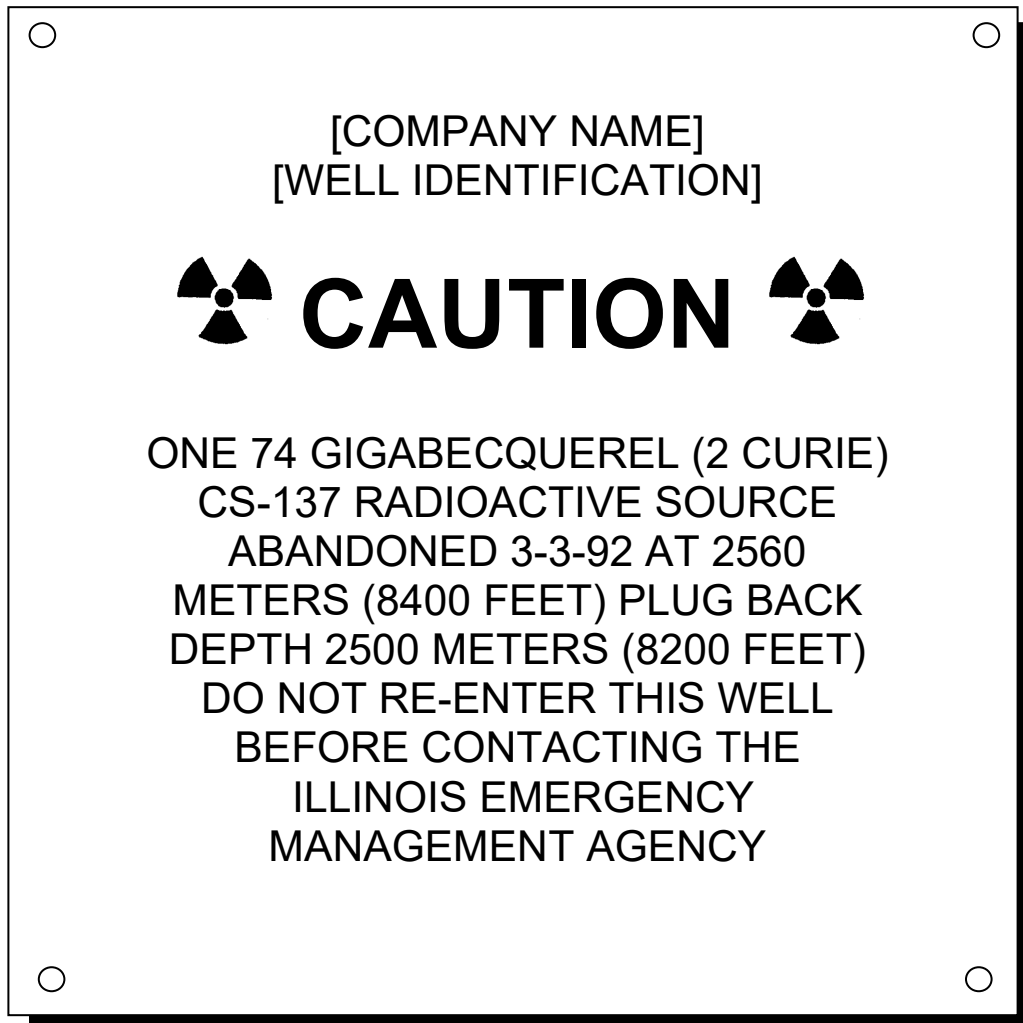
- 2) A description of the irretrievable well logging source involved, including radionuclide, quantity, and chemical and physical form;
- 3) Surface location and identification of well;
- 4) Results of efforts to immobilize and seal the source in place;
- 5) A brief description of the attempted recovery effort;
- 6) Depth of the radioactive source;
- 7) Depth of the top of the cement plug;
- 8) Depth of the well;
- 9) The immediate threat to public health and safety justification for implementing abandonment if prior Agency approval was not obtained under subsection (c)(1)(A);
- 10) Any other information, such as a warning statement, contained on the permanent identification plaque; and
- 11) A list of the State and federal agencies receiving a copy of this report.

Section 351.APPENDIX A Subjects To Be Included In Training Courses For Logging Supervisors

AGENCY NOTE: Licensees may wish to refer to Section 8.8 and Appendix F of the U.S. Nuclear Regulatory Commission's NUREG 1556 Volume 14, Rev. 1 for additional guidance on training requirements, expectations on course length, duration of on-the-job training for both well logging supervisors and logging assistants, instructor minimum qualifications, and additional information to be submitted for Agency evaluation.

- a) Fundamentals of Radiation Safety
 - 1) Characteristics of radiation
 - 2) Units of radiation dose and quantity of radioactivity
 - 3) Significance of radiation dose
 - A) Radiation protection standards
 - B) Biological effects of radiation dose
 - 4) Levels of radiation from licensed material
 - 5) Methods of minimizing radiation dose
 - A) Working time
 - B) Working distances
 - C) Shielding
 - 6) Radiation safety practices, including prevention of contamination, and methods of decontamination.
- b) Radiation Detection Instrumentation to be Used
 - 1) Use of radiation survey instruments
 - A) Operation
 - B) Calibration
 - C) Limitations

- 2) Radiation Survey Techniques
- 3) Use of personnel monitoring equipment
- c) Equipment to be Used
 - 1) Operation of equipment, including source handling equipment and remote handling tools;
 - 2) Storage, control, and disposal of licensed material; and
 - 3) Maintenance of equipment
- d) The Requirements of Pertinent State Regulations
- e) Case histories of accidents in well logging.

Section 351.APPENDIX B Example of Plaque for Identifying Wells Containing Sealed Sources Containing Radioactive Material Abandoned Downhole

The size of the plaque should be convenient for use on active or inactive wells, e.g., a 17-centimeter (7-inch) square and 3 mm ($\frac{1}{8}$ inch) thick. Letter size of the word "CAUTION" should be approximately twice the letter size of the rest of the information, e.g., 12-millimeter ($\frac{1}{2}$ -inch) and 6-millimeter ($\frac{1}{4}$ -inch) letter size, respectively. Quantities and distances may be expressed either in SI units or in special and English units or in dual units.