

**PART W**

**RADIATION SAFETY REQUIREMENTS FOR ~~WIRELINE~~  
SERVICEWELL LOGGING OPERATIONS AND SUBSURFACE TRACER STUDIES**

Sec. W.1 - Purpose.

The regulations in this Part ~~prescribe requirements for the issuance of a license establish radiation safety requirements for using sources of radiation for wireline service operations including mineral logging, radioactive markers, and subsurface tracer studies.~~ authorizing the use of licensed materials ~~including~~ sealed source, radioactive tracers, radioactive markers, and uranium sinker bars in well logging in a single well. This Part also prescribes radiation safety requirements for ~~ersons~~ persons using licensed materials in these operations. –The provisions and requirements of this Part are in addition to, and not in substitution for, the requirements of Parts A, B, C, D, ~~and J and T~~ of these regulations.

Sec. W.2 - Scope. The regulations in this Part apply to all licensees or registrants who use sources of radiation for ~~wireline service~~ well logging operations including mineral-logging, radioactive markers, or subsurface tracer studies.

Sec. W.3 - Definitions. As used in this Part, the following definitions apply:

"Energy compensation source (ECS)" means a ~~small~~ sealed source, with an activity not exceeding 3.7 MBq (100 µCi), used within a ~~log~~ logging tool, or other tool ~~components~~ components, to provide a reference standard to maintain the tool's calibration when in use.

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

"Fresh water aquifer," for the purpose of the Part, means a geologic formation that is capable of yielding fresh water to a well or spring.

"Global Positioning System (GPS)" means a system of orbiting satellites that transmit precise signals enabling GPS receivers to determine their current location (latitude and longitude coordinates), the time, and their velocity.

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

"Irretrievable well logging source" means any sealed source containing licensed material that is in a well and has either: (a) detached from a wireline logging tool or (b) is contained within any other well logging tool (for example a LWD tool) over which control has been lost and for which all reasonable effort at recovery has been expended.

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Comment [rw2]: means a system of orbiting satellites that transmit precise signals enabling GPS receivers to determine their current location (latitude and longitude coordinates), the time, and their velocity.

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"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 W.401~~.

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"Logging supervisor" means the individual who uses sources of radiation or provides personal supervision of the utilization of sources of radiation at the well site ~~and who is responsible to the licensee for assuring compliance with the requirements of the applicable regulations and license conditions.~~

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

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"Logging while drilling (LWD)" ~~along with measurement while drilling (MWD)~~, means a technique of acquiring geologic formation properties, directional surveys and other information in real-time while drilling a well.

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

"Personal supervision" means guidance and instruction by the logging supervisor who is physically present at the jobsite and ~~watching~~ observing the performance of the operation in such proximity that contact can be maintained and immediate assistance given as required.

"Radioactive marker" means radioactive material ~~placed subsurface or on a structure intended for subsurface use for the purpose of depth determination or direction orientation~~ 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 radioactive source is placed for the purpose of facilitating the handling and use of the source in well logging operations.

"Subsurface tracer study" means the release of ~~unsealed a substance tagged with~~ radioactive material or a substance labeled with radioactive material released into a well for the purpose of tracing the movement or position of the ~~tagged material or~~ substance in the well ~~bore~~ or adjacent formation.

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"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.

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"Temporary jobsite" means a location where radioactive materials are present for the purpose of

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performing ~~wireline well logging service~~ operations or subsurface tracer studies.

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~~"Tritium neutron generator target source" means a tritium source used within a neutron generator tube to produce neutrons for use in well logging applications.~~

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

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

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

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~~"Well logging" means all operations involving the lowering and raising of measuring devices or tools which may contain sources of radiation into wells-bores or cavities for the purpose of obtaining information about the well or adjacent formations which may be used in oil, gas, mineral, groundwater, or geological exploration.~~

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"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.~~

**Prohibition Agreement with Well Owner or Operator**

Sec. W.4 - ~~Prohibition~~Conditions of Agreement.

- a. No licensee shall perform ~~wireline well logging service~~ operations with a sealed source(s) or subsurface tracer(s) unless, prior to commencement of the operation, the licensee has a written agreement with the well operator, well owner, drilling contractor, or land owner that:
  - ai. In the event a sealed source is lodged downhole, a reasonable effort at recovery will be made;
  - and
  - ii. A person may not attempt to recover a sealed source in a manner which, in the licensee's opinion, could result in its rupture;
  - iiib. In the event a decision is made to abandon the sealed source downhole, the requirements of Paragraph W.501c.i. [and the name of any other State Agency having applicable regulations] shall be met.

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c. The applicant shall establish and submit to the Agency its program for annual audit of the job performance of each logging supervisor to ensure that the Agency's regulations, license requirements, and the applicant's operating and emergency procedures are followed. Inspection records must be retained for 3 years after each annual internal audit.

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d. The applicant shall submit a description of its overall organizational structure as it applies to the radiation safety responsibilities in well logging, including specified delegations of authority and responsibility.

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e. If an applicant wants to perform leak testing of sealed sources, the applicant shall identify the manufacturers and the model numbers of the leak test kits to be used. If the applicant wants to analyze its own wipe samples, the applicant shall establish procedures to be followed and submit a description of these procedures to the Agency. The description must include the:

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i. Instruments to be used;

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ii. Methods of performing the analysis; and

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iii. Pertinent experience of the person who will analyze the wipe samples.

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Sec. W.47 - Radioactive Markers. The licensee may use radioactive markers in wells only if the individual markers contain quantities of licensed material not exceeding the quantities specified in Part C, Appendix B of these regulations. The use of markers is subject only to the requirements of W.106.

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Sec. W.49 - Uranium Sinker Bars. The licensee 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."

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Sec. W.51 - Use of a Sealed Source in a Well Without a 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 source becoming lodged in the well. The procedure must be approved by the Agency.

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Sec. W.53 - Energy Compensation Source. The licensee may use an energy compensation source (ECS) which 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 microcuries].

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a. For well logging applications with a surface casing for protecting fresh water aquifers, use of the ECS is only subject to the requirements of W.105, W.106 and W.107.

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b. For well logging applications without a surface casing for protecting fresh water aquifers, use of the ECS is only subject to the requirements of W.4, W.105, W.106, W.107, W.51 and W.501.

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Sec. W.55 - Tritium Neutron Generator Target Source.

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a. Use of a tritium neutron generator target source, containing quantities not exceeding 1,110 GBg [30 curies] and in a well with a surface casing to protect fresh water aquifers, is subject to the requirements of this Part except W.4, W.108 and W.501.

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b. Use of a tritium neutron generator target source, containing quantities exceeding 1,110 GBg [30 curies] or in a well without a surface casing to protect fresh water aquifers, is subject to the requirements of this Part except W.108

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**Equipment Control**

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Sec. W.101 - Limits on Levels of Radiation. Sources of radiation shall be used, stored, and transported in such a manner that the transportation requirements of Part T and the dose limitation requirements of Part D of these regulations are met.

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Sec. W.102 - Storage Precautions. The licensee shall store each source containing licensed material in a storage container or transportation package. The container or package must 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.

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a. ~~Each source of radiation, except accelerators, shall be provided with a storage 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 source of radiation.~~

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b. ~~Sources of radiation shall be stored in a manner which will minimize danger from explosion or fire.~~

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Sec. W.103 - Transport Precautions. 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. ~~Transport containers shall be physically secured to the transporting vehicle to prevent accidental loss, tampering, or unauthorized removal.~~

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Sec. W.104 - Radiation Survey Instruments.

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a. The licensee shall keep a calibrated and operable radiation survey instrument capable of detecting beta and gamma radiation at each field station and temporary jobsite to make the radiation surveys required by this Part and by Part C of these regulations. To satisfy this requirement, the radiation survey instrument must be capable of measuring 0.001 mSv (0.1 mrem) per hour through at least 0.5 mSv (50 mrem) per hour.

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b. The licensee shall keep appropriate [calibrated and]operable radiation detection instruments sensitive enough to detect:

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i. The radiation and contamination levels that could be encountered if a sealed source ruptured; and

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ii. If neutron emitting sources are used, neutrons where the neutron source may contribute more than five percent (5%) of a relevant dose limit.

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~~The licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments at each field station to make physical radiation surveys as required by this Part and by Section D.201 of these regulations. Instrumentation shall be capable of measuring 25.8 nanocoulombs/kg (0.1 milliroentgen) per hour through at least 12.9 microcoulombs/kg (50 milliroentgens) per hour. Survey instruments acquired before [insert the effective date of this Part] and capable of measuring 25.8 nanocoulombs/kg (0.1 milliroentgen) per hour through at least (20 milliroentgens) 5.16 microcoulombs/kg per hour also satisfies this requirement [insert date 5 years after the effective date of this Part].~~

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bc. Each radiation survey instrument shall be calibrated in accordance with procedures outlined in ANSI ():

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i. At intervals not to exceed 6 months and after each instrument servicing:

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ii. For linear scale instruments, at two points located approximately 1/3 and 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

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iii. So that accuracy within 20 percent of the true radiation level can be demonstrated on each scale.

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de. Calibration records shall be maintained for a period of ~~two~~three years for inspection by the Agency.

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Sec. W.105 - Leak Testing of Sealed Sources.

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a. Exemptions. The following sources are exempted from the periodic leak test requirements of Paragraphs W.105b. through e.:

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i. Hydrogen-3 sources;

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ii. Sources of radioactive material with a half-life of 30 days or less;

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iii. Sealed sources of radioactive material in gaseous form;

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W.105b. and c. 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 Agreement State or NRC 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 Agreement State or NRC licensee that is authorized to perform these functions. A report of leaking sources shall be filed in accordance with W.501a. ~~If the test reveals the presence of 185 Bq (0.005 μCi) or more of leakage or contamination, the licensee shall immediately withdraw the source from use and shall cause it to be decontaminated, repaired, or disposed of in accordance with these regulations. A report describing the equipment involved, the test results, and the corrective action taken shall be filed with the Agency within five days of receiving the test results.~~

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e. ~~Exemptions. The following sources are exempted from the periodic leak test requirements of Paragraphs W.105a. through d.:~~

- ~~i. Hydrogen 3 sources;~~
- ~~ii. Sources of radioactive material with a half life of 30 days or less;~~
- ~~iii. Sealed sources of radioactive material in gaseous form;~~
- ~~iv. Sources of beta or gamma emitting radioactive material with an activity of 3.7 MBq (100 μCi) or less; and~~
- ~~v. Sources of alpha emitting radioactive material with an activity of 0.370 MBq (10 μCi) or less.~~

Sec. W.106 - Quarterly Inventory. Each licensee or registrant shall conduct a quarterly physical inventory to account for all sources of radiation. Records of inventories shall be maintained for ~~two~~ **three** years from the date of the inventory for inspection by the Agency and shall include the quantities and kinds of sources of radiation, the location where sources of radiation are assigned, the date of the inventory, and the name of the individual conducting the inventory.

Sec. W.107 - Utilization Records. Each licensee or registrant shall maintain current records, which shall be kept available for inspection by the Agency for ~~two~~ **three** 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; and~~
- d. ~~In the case of tracer materials and radioactive markers, the utilization record shall indicate the~~

radionuclide and activity used in a particular well and disposal of any unused tracer material.

Sec. W.108 - Design, Performance, and Certification Criteria for Sealed Sources Used in Downhole Operations.

a. A licensee may use a sealed source for use in well logging applications if, ~~Each sealed source, except those containing radioactive material in gaseous form, used in downhole operations and manufactured after [insert a date one year after the effective date of this Part] shall be certified by the manufacturer, or other testing organization acceptable to the Agency, to meet the following minimum criteria:~~

i. ~~The sealed source is doubly encapsulated. Be of doubly encapsulated construction;~~

ii. ~~The sealed source contains licensed material whose chemical and physical forms are as insoluble and nondispersible as practical. Contain radioactive material whose chemical and physical forms are as insoluble and non-dispersible as practical; and~~

iii. ~~Meets the requirements of paragraph (b), (c), or (d) of this section. Has been individually pressure tested to at least 170 MN/m<sup>2</sup> (24,656 lbs/in<sup>2</sup> absolute) without failure.~~

b. For a sealed source manufactured on or before July 14, 1989, a licensee may use the sealed source, for use in well logging applications if it meets the requirements of US ANSI N5.10-1968, "Classification of Sealed Radioactive Sources," or the requirements in paragraph (c) or (d) of this section. ~~For sealed sources, except those containing radioactive material in gaseous form, acquired after [insert a date one year after the effective date of this Part], in the absence of a certificate from a transferor certifying that an individual sealed source meets the requirements of W.108a, the sealed source shall not be put into use until such determinations and testing have been performed.~~

c. For a sealed source manufactured after July 14, 1989, a licensee may use the sealed source, for use in well logging applications if it meets the oil-well logging requirements of ANSI/HPS N43.6-1997, "Sealed Radioactive Sources-Classification." ~~Each sealed source, except those containing radioactive material in gaseous form, used in downhole operations after [insert a date two years after the effective date of this Part] shall be certified by the manufacturer, or other testing organization acceptable to the Agency, as meeting the sealed source performance requirements for oil well logging as contained in the American National Standard N43.6, "Classification of Sealed Radioactive Sources," (formerly N542, ANSI/NBS 126) in effect on [insert the effective date of this Part].~~

d. For a sealed source manufactured after July 14, 1989, a licensee may use the sealed source, for use in well logging applications, if:

i. The sealed source's prototype has been tested and found to maintain its integrity after each of the following tests:

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- (a) *Temperature.* The test source must be held at -40° C for 20 minutes, 600° C for 1 hour, and then be subject to a thermal shock test with a temperature drop from 600° C to 20° C within 15 seconds.
- (b) *Impact Test.* A 5 kg steel hammer, 2.5 cm in diameter, must be dropped from a height of 1 m onto the test source.
- (c) *Vibration test.* The test source must be subject to a vibration from 25 Hz to 500 Hz at 5 g amplitude for 30 minutes.
- (d) *Puncture test.* A 1 gram hammer and pin, 0.3 cm pin diameter, must be dropped from a height of 1 m onto the test source.
- (e) *Pressure test.* The test source must be subject to an external pressure of 1.695 x 10<sup>8</sup> pascals [24,600 pounds per square inch absolute].

e. The requirements in paragraph (a), (b), (c), and (d) of this section do not apply to sealed sources that contain licensed material in gaseous form.

f. The requirements in paragraphs (a), (b), (c), and (d) of this section do not apply to energy compensation sources (ECS). ECSs must be licensed or registered with the Agency, an Agreement State, or with the NRC under 10 CFR 32.210. ~~Certification documents shall be maintained for inspection by the Agency for a period of two years after source disposal. If the source is abandoned downhole, the certification documents shall be maintained until the Agency authorizes disposition.~~

Sec. W.109 - Labeling.

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<sup>1/</sup>  
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<sup>1/</sup>

<sup>1/</sup> or CAUTION

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RADIOACTIVE  
NOTIFY CIVIL AUTHORITIES [OR NAME OF COMPANY]

Sec. W.110 - Inspection and Maintenance.

a. Each licensee 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 that required labeling is present. If defects are found, the equipment must be removed from service until repaired, and a record must be made listing:

- i. The date of check;
- ii. The name of inspector;
- iii. The equipment involved;
- iv. The defects found; and
- v. The repairs made.

These records must be retained for 3 years after the defect is found.

b. Each licensee or registrant shall 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, uranium sinker bars, and injection tools to assure proper labeling and physical condition. Records of inspection and maintenance shall be maintained for a period of ~~two~~ three years for inspection by the Agency.

bc. If any inspection conducted pursuant to ~~Paragraph~~ W.110a. reveals damage to labeling or components critical to radiation safety, the device shall be removed from service until repairs have been made.

ed. If a sealed source is stuck in the source holder, the licensee shall not perform any operation, such as drilling, cutting, or chiseling, on the source holder unless the licensee is specifically approved by the ~~the~~ Agency, NRC, an Agreement State, or a ~~Licensing State~~ the NRC to perform this operation.

de. The repair, opening, or modification of any sealed source shall be performed only by persons specifically authorized to do so by the Agency, the NRC, an Agreement State, or a Licensing State.

Requirements for Personnel Safety

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Sec. W.201 - Training Requirements.

- a. No licensee or registrant shall permit any individual to act as a logging supervisor as defined in this Part until such individual has:
  - i. Received, in a course recognized by the Agency, the NRC, ~~or a Licensing State,~~ instruction in the subjects outlined in Appendix A of this Part and demonstrated an understanding thereof;
  - ii. Read and received instruction in the regulations contained in this Part and the applicable Sections of Parts A, D, and J of these regulations or their equivalent, conditions of appropriate license or certificate of registration, and the licensee's or registrant's operating and emergency procedures, and demonstrated an understanding thereof; and
  - iii. ~~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 Demonstrated competence to use sources of radiation, related handling tools, and radiation survey instruments which will be used on the job.~~
  - iv. Has demonstrated understanding of the requirements of W.201a.i. through W.201a.iii. by successfully completing a written test.
- b. No licensee or registrant may permit an individual to act as a logging assistant until that person--
  - i. Has received instruction in applicable sections of Parts D and J of these regulations;
  - ii. Has received copies of, and instruction in, the licensee's operating and emergency procedures required by W.202;
  - iii. Has demonstrated understanding of the materials listed in W.201a.i and W.201a.ii. by successfully completing a written or oral test; and
  - iv. Has received instruction in the use of licensed materials, remote handling tools, and radiation survey instruments, as appropriate for the logging assistant's intended job responsibilities.

~~No licensee or registrant shall permit any individual to assist in the handling of sources of radiation until such individual has:~~

  - i. ~~Read or received instruction in the licensee's or registrant's operating and emergency procedures and demonstrated an understanding thereof; and~~
  - ii. ~~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.~~

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c. ~~e.~~ The licensee or registrant shall maintain employee training records for inspection by the Agency for ~~two~~ three years following termination of the individual's employment.

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d. The licensee shall provide safety reviews for logging supervisors and logging assistants at least once during each calendar year.

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e. The licensee or registrant shall maintain a record on each logging supervisor's and logging assistant's training and annual safety review. The training records must include copies of written tests and dates of oral tests. The training records must be retained until 3 years following the termination of employment. Records of annual safety reviews must list the topics discussed and be retained for 3 years.

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Sec. W.202 - Operating and Emergency Procedures. The licensee's or registrant's operating and emergency procedures shall include instructions in at least the following:

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a. Handling and use of sources of radiation including but not limited to sealed sources and tracers, to be employed so that no individual is likely to be exposed to radiation doses in excess of the standards established in Part D of these regulations;

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b. Methods and occasions for conducting radiation surveys;

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c. Methods and occasions for locking and securing sources of radiation;

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d. Personnel monitoring and the use of personnel monitoring equipment;

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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;

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f. Minimizing exposure of individuals in the event of an accident;

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g. Procedure for notifying proper personnel (e.g., RSO, well operator/owner, landowner, regulatory agency) in the event of an accident;

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h. Maintenance of records;

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i. Use, inspection and maintenance of source holders, logging tools, source handling tools, storage containers, transport containers, and injection tools;

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j. Procedure to be followed in the event a sealed source is lodged downhole;

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k. Procedures to be used for picking up, receiving, and opening packages containing radioactive

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material;

l. For the use of tracers, decontamination of the environment, equipment, and personnel;

m. Maintenance of records generated by logging personnel at temporary jobsites;

~~n. Notifying proper persons 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 and minimize inhalation and ingestion of radioactive material and actions to obtain suitable radiation survey instruments as required by Section W.104.~~

~~p. The 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 W.110; and~~

~~q. Identifying and reporting to the Agency defects and noncompliance as required by Part E.38 of these regulations; and~~

~~r. 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.~~

~~Sec. W.203 - Personnel Monitoring. [Individual Monitoring]. The licensee shall provide personnel monitoring [individual monitoring], as required by Part D of these regulations.~~

~~a. No licensee or registrant shall permit any individual to act as a logging supervisor or to assist in the handling of sources of radiation unless each such individual wears a personnel [individual] dosimeter that is processed and evaluated by an accredited National Voluntary Laboratory Accreditation Program (NVLAP) processor either a film badge or a thermoluminescent dosimeter (TLD). Each film badge or TLD personnel [individual] dosimeter shall be assigned to and worn by only one individual. Film badges must be replaced at least monthly, and TLDs other personnel [individual] dosimeters must be replaced at least quarterly. After replacement, each film badge or TLD personnel [individual] dosimeter must be promptly processed.~~

~~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 W.203a. and bioassay results for inspection until the Agency authorizes disposition of the records. Personnel monitoring records shall be maintained for inspection until the Agency authorizes disposition.~~

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**Precautionary Procedures in Logging and Subsurface Tracer Studies**

Sec. W.301 - Security.

- a. A logging supervisor must 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.
- b. Should a source become lodged in a well, and if the logging supervisor is the only licensee's employee onsite, the logging supervisor may leave the jobsite to obtain assistance, provided that:
  - i. The supervisor has established a controlled area;
  - ii. Barriers are in place to prevent unauthorized entry into the controlled area; and
  - iii. No further action has been taken until the supervisor has arrived back on the jobsite.

c. During each logging or tracer application, the logging supervisor or other designated employee shall maintain direct surveillance of the operation to protect against unauthorized or unnecessary entry into a restricted area, as defined in Part A of these regulations.

Sec. W.302 - Handling Tools. The licensee shall provide and require the use of tools that will assure remote handling of sealed sources other than low-activity calibration sources.

Sec. W.303 - Subsurface Tracer Studies.

- a. Protective gloves and other appropriate protective clothing and equipment shall be used by all personnel handling radioactive tracer material. Precautions shall be taken to avoid ingestion or inhalation of radioactive material, ~~and to avoid contamination of field stations and temporary jobsites.~~
- b. No licensee shall cause the injection of radioactive material into potable aquifers without prior written authorization from the Agency [and any other appropriate State Agency].

Sec. W.304 - 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 so controlled or shielded that the requirements of ~~Sections Part D.1001 and D.105-1004~~ of these regulations, as applicable, are met.

**Radiation Surveys and Records**

Sec. W.401 - Radiation Surveys.

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- a. ~~An appropriate survey meter shall be used to insure that radiation hazards are evaluated as required by W.401b. through W.401h. Radiation surveys or calculations shall be made and recorded for each area~~ where radioactive materials are used and stored.
- b. Radiation surveys 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 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 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. ~~If the tool contained a neutron source, the measurement is to be taken after the decay of any activation of the tool and its components to differentiate between the activation products and any potential contamination.~~
- d. ~~Immediately following the transfer of the source from the logging tool to the transport container, and prior to leaving the temporary jobsite, the licensee shall perform a radiation survey of the transport/source storage container to confirm that the source is in the shielded position.~~
- de. Radiation surveys shall be made and recorded at the jobsite or well-head 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.
- ef. ~~Surveys of the storage area shall be performed with the maximum number of radiation sources possessed present.~~
- g. ~~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.~~
- h. Records required pursuant to Paragraphs W.401a. through ~~eg.~~ 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~~three years after completion of the survey.

Sec. 402 - Radioactive Contamination Control.

- a. ~~If the licensee detects evidence that a sealed source has ruptured or licensed materials have caused contamination, the licensee shall initiate immediately the emergency procedures required by W.202 and notify the Agency as required by W.501.~~
- b. ~~If contamination results from the use of licensed material in well logging, the licensee shall:~~
  - i. ~~Decontaminate all work areas, equipment, and unrestricted areas in accordance with W.202; or~~

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shall provide a permanent plaque<sup>2/</sup> for posting the well ~~or well bore~~. This plaque shall:

i. Be constructed of long-lasting material, such as stainless steel or monel; and

ii. Contain the following information engraved on its face:

- (1) The word "CAUTION";
- (2) The radiation symbol without the conventional color requirement;
- (3) The date of abandonment;
- (4) The name of the well-operator or well-owner;
- (5) The well name and well identification number(s) or other designation;
- (6) The sealed source(s) by radionuclide and activity;
- (7) The source depth, ~~the true depth to the top of the plug and GPS coordinates for the location of the source~~ and ~~the depth to the top of the plug~~; and
- (8) An appropriate warning, depending on the specific circumstances of each abandonment.<sup>3/</sup>

~~ef.~~ The licensee shall ~~immediately~~ notify the Agency ~~immediately~~ by telephone and subsequently by confirming letter if the licensee knows or has reason to believe that ~~licensed~~ radioactive material has been lost in or to an underground potable aquifer. 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.

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<sup>2/</sup> An example of a suggested plaque is shown in Appendix B of this Part.  
<sup>3/</sup> 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 [insert the name of the radiation control Agency]".



**Part W**

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**APPENDIX A**

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**SUBJECTS TO BE INCLUDED IN TRAINING COURSES  
FOR LOGGING SUPERVISORS**

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**I. Fundamentals of Radiation Safety**

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**A. Characteristics of radiation**

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**B. Units of radiation dose and quantity of radioactivity**

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**C. Significance of radiation dose**

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**1. Radiation protection standards**

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**2. Biological effects of radiation dose**

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**D. Levels of radiation from sources of radiation**

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**E. Methods of minimizing radiation dose**

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**1. Working time**

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**2. Working distances**

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**3. Shielding**

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**F. Radiation safety practices including prevention of contamination and methods of decontamination**

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**II. Radiation Detection Instrumentation to be Used**

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**A. Use of radiation survey instruments**

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**1. Operation**

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**2. Calibration**

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**3. Limitations**

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**B. Survey techniques**

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**C. Use of personnel monitoring equipment**

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**III. Equipment to be used including:**

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**A. Operation of equipment, including source handling equipment and remote handling tools;**

**B. Storage, control, and disposal of licensed material; and**

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**C. Maintenance of equipment. ~~Equipment to be Used~~**

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~~**A. Handling equipment**~~

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~~**B. Sources of radiation**~~

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~~**C. Storage and control of equipment**~~

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~~**D. Operation and control of equipment**~~

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**IV. The Requirements of ~~P~~pertinent ~~F~~Federal and ~~S~~State and ~~f~~federal Regulations**

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V. The Licensee's or Registrant's Written Operating and Emergency Procedures

~~VI.~~ VI. The Licensee's or Registrant's Record Keeping Procedures

VII. Case histories of accidents in well logging

Part W

**APPENDIX B**

**EXAMPLE OF PLAQUE FOR IDENTIFYING WELLS CONTAINING SEALED SOURCES  
CONTAINING RADIOACTIVE MATERIAL ABANDONED DOWNHOLE**

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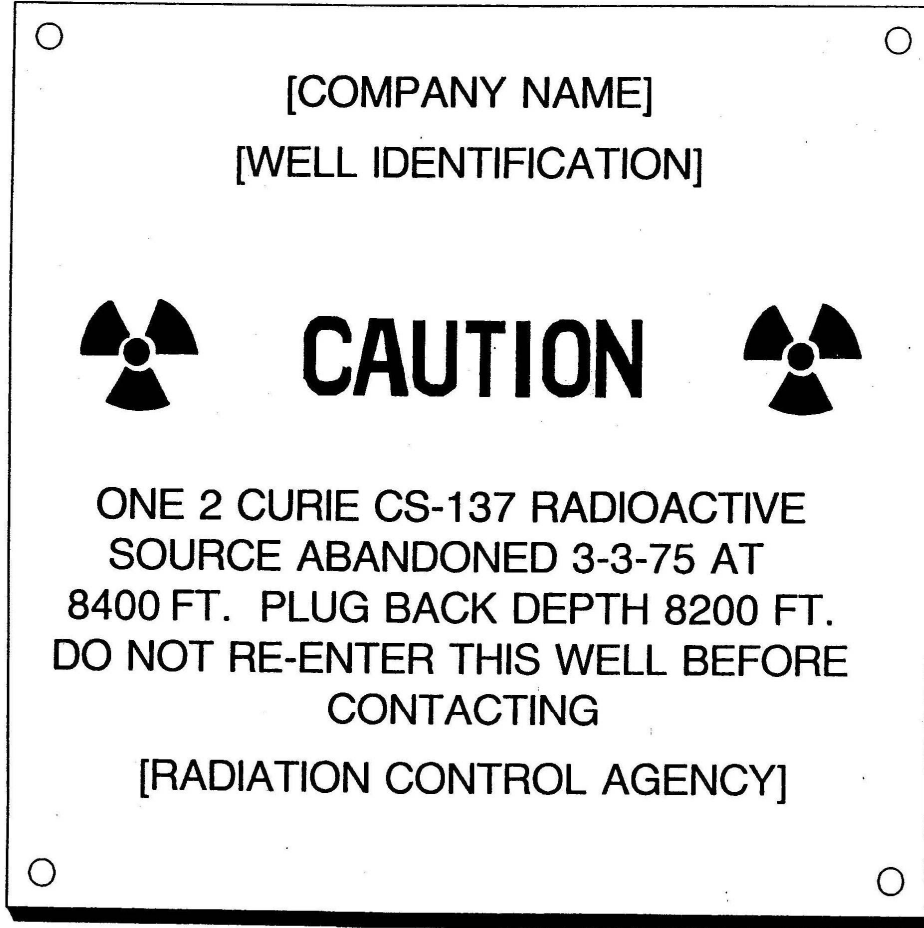
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The size of the plaque should be convenient for use on active or inactive wells, e.g., a 7-inch square,  $\frac{1}{8}$  inch thick. Letter size of the word "CAUTION" should be approximately twice the letter size of the rest of the information, e.g.,  $\frac{1}{2}$ -inch and  $\frac{1}{4}$ -inch letter size, respectively.

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