

Subchapter V — Radiation Safety Requirements for Well Logging

DHS 157.51 Prohibition. (1) WELL LOGGING. (a) A licensee may not perform well logging with a sealed source unless, prior to commencement of the operation, the licensee has a written agreement with the well operator, well owner or land owner that includes all the following provisions:

1. In the event a sealed source is lost in the well, the licensee shall make a reasonable effort at recovery unless, in the licensee's opinion, the recovery effort could result in rupture of the sealed source.

2. If a decision is made to abandon the sealed source in the well, the licensee shall meet the requirements of s. DHS 157.56 (3) and any requirements of the department of natural resources under chs. NR 141, 500 to ~~55544~~, and 812.

3. If the environment, any equipment, or personnel are contaminated with licensed material, the equipment or personnel shall be decontaminated before release from the site or the site shall be decontaminated before release for unrestricted use.

(b) The licensee shall retain a copy of the written agreement for three years after the completion of the well logging operation.

(c) The licensee shall notify the department of natural resources prior to commencement of any operation involving well logging in a fresh water aquifer.

(2) ACCELERATORS. A licensee or registrant may not permit above-ground testing of 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 area or facility meets the requirements of s. DHS 157.21, as applicable.

History: CR 01-108: cr. Register July 2002 No. 559, eff. 8-1-02; CR 06-021: renum. (1) to be (1) (a) and am. (1) (a) (intro.) to 2., cr. (1) (b) and (c) Register October 2006 No. 610, eff. 11-1-06; correction in (1) (a) 2. made under s. 13.92 (4) (b) 7., Stats., Register March 2014 No. 699.

DHS 157.52 Equipment control. (1) LIMITS ON LEVELS OF RADIATION. Sources of radiation shall be used, stored and transported in accordance with the transportation requirements of subch. XIII and the dose limitation requirements of subch. III.

(2) STORAGE PRECAUTIONS. (a) Each source of radiation, except accelerators, shall be provided with a storage or transport container. The container shall be equipped with a lock, or tamper seal for calibration sources, to prevent unauthorized removal of or exposure to the source of radiation.

(b) A source of radiation shall be stored in a manner that minimizes danger from explosion or fire.

(3) TRANSPORT PRECAUTIONS. A transport container shall be physically secured to the transporting vehicle to prevent accidental loss, tampering or unauthorized removal.

(4) RADIATION SURVEY INSTRUMENTS. (a) A licensee or registrant shall maintain sufficient calibrated and operable radiation survey instruments at each field station and temporary job site to make physical radiation surveys as required by this subchapter and by s. DHS 157.25 (1). Instrumentation shall be capable of measuring one ~~uSv-microsieverts~~ (0.1 ~~milliroentgenmillirem~~) per hour through at least 0.5 ~~mSv-millisieverts~~ (50 ~~milliroentgenmillirem~~) per hour.

(b) Each radiation survey instrument shall be calibrated according to all the following requirements:

1. At energies and geometry appropriate for use.

2. At intervals not to exceed 12 months and after each instrument servicing.

3. For linear scale instruments, at 2 points located approximately one-third and two-thirds of full-scale on each scale; for logarithmic scale instruments, at midrange of each decade, and at 2 points of at least one decade; and for digital instruments, at appropriate points.

4. At an accuracy within 20% of the true radiation level on each scale.

(c) Calibration records shall be maintained for a period of 3 years after the calibration date for inspection by the department.

(d) A licensee or registrant shall have available additional calibrated and operable radiation survey instruments that are capable of detecting low radiation and contamination levels that could be encountered if a sealed source ruptured. A licensee or registrant may own the instruments or may have a written procedure to obtain them within 24 hours from another location.

(5) LEAK TESTING OF SEALED SOURCES. (a) A licensee using sealed sources of radioactive material shall have the sources tested for leakage. Records of leak test results shall be kept in units of becquerels or microcuries and maintained for inspection by the department for 3 years after the leak test is performed or until transfer or disposal of the sealed source.

(b) Tests for leakage shall be performed only by persons specifically authorized to perform such tests by the department, the NRC, an agreement state or a licensing state. The test for leakage shall be performed using a test kit or method approved by the department, the NRC, an agreement state or a licensing state. The test sample shall be taken from the surface of the source, source holder or from the surface of the device in which the source is stored or mounted and on which one might expect contamination to accumulate. The test sample shall be analyzed for radioactive contamination and the analysis shall be capable of detecting the presence of 185 becquerels (0.005 microcurie) of radioactive material on the test sample.

(c) Each sealed source of radioactive material shall be tested at intervals not to exceed 6 months, except energy compensation sources which may be tested every 3 years. In the absence of a certificate from a transferor indicating that a test has been made prior to the transfer, the sealed source may not be put into use until tested. If, for any reason, it is suspected that a sealed source may be leaking, it shall be removed from service immediately and tested for leakage within 30 calendar days.

(6) LEAKING OR CONTAMINATED SOURCES. If leak testing of a source reveals the presence of 185 becquerels (0.005 microcurie) or more of leakage or contamination, a licensee shall immediately withdraw the source from use and shall cause it to be decontaminated, repaired or disposed of under the requirements of this chapter. A licensee shall file a written report with the

department within 5 days of receiving the test results that describes the equipment involved, the test results and the corrective action taken.

(7) EXEMPTIONS. The following sources are exempted from the requirements of subs. (5) and (6).

- (a) Hydrogen-3 sources.
- (b) Sources of radioactive material with a half-life of 30 days or less.
- (c) Sealed sources of radioactive material in gaseous form.
- (d) Sources of beta- or gamma-emitting radioactive material with an activity of 3.7 MBq (100 microcuries) or less.
- (e) Sources of alpha- or neutron emitting radioactive material with an activity of 0.370 MBq (10 microcuries) or less.

(8) PHYSICAL INVENTORY. A licensee or registrant shall conduct a semi-annual physical inventory to account for all sources of radiation. Records of inventories shall be maintained for 3 years from the date of the inventory for inspection by the department 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.

(9) UTILIZATION RECORDS. A licensee or registrant shall maintain current records, which shall be kept available for inspection by the department for 3 years from the date of the recorded event, showing all of 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 who is responsible for the sources of radiation used and the identity of the well logging assistants present.
- (c) Locations where used and dates of use.
- (d) In the case of tracer materials and radioactive markers, the utilization record shall indicate the radionuclide and activity used in a particular well and the disposition of any unused tracer material.

(10) DESIGN PERFORMANCE CRITERIA FOR SEALED SOURCES. (a) Each sealed source, except those containing radioactive material in gaseous form or in energy compensation sources (ECS), used in well logging applications, shall meet all the following criteria:

1. Have doubly encapsulated construction.
2. Contain licensed material whose chemical and physical forms are as insoluble and non-dispersable as practical.
3. Meet the requirements of par. (b).

(b) Each sealed source, except those used in energy compensation sources (ECS), shall meet one of the following requirements:

1. For a sealed source manufactured on or before July 14, 1989, the requirements from the United States of America Standards Institute N5.10-1968, "Classification of Sealed Radioactive Sources."
2. For a sealed source manufactured after July 14, 1989, the oil-well logging requirements from the American National Standard Institute/Health Physics Society N43.6-1997, "Sealed Radioactive Sources-Classification."
3. For a sealed source manufactured after July 14, 1989, the sealed source's prototype has been tested and found to maintain its integrity after each of the following tests:
 - a. Temperature. The test source shall be held at -40 degrees Celsius for 20 minutes, 600 degrees Celsius for one hour, and then be subjected to a thermal shock test with a temperature drop from 600 degrees Celsius to 20 degrees Celsius within 15 seconds.
 - b. Impact. A 5 kilogram (kg) steel hammer, 2.5 centimeters in diameter, shall be dropped from a height of 1 meter (m) onto the test source.
 - c. Vibration. The test source shall be subjected to a vibration from 25 Hertz (Hz) to 500 Hz with a peak amplitude of five times the acceleration of gravity for 30 minutes.
 - d. Puncture. A 1 gram (gm) hammer and pin, 0.3 centimeter (cm) pin diameter, shall be dropped from a height of 1 meter (m) onto the test source.
 - e. Pressure. The test source shall be subjected to an external pressure of 24,600 pounds per square inch absolute (1.695×10^7 pascals) without leakage.

Note: The publication, "Sealed Radioactive Sources — Classification," American National Standard Institute/Health Physics Society N43.6-1997, published by the American National Standard Institute, may be consulted at the Department of Health Services, Radiation Protection Section, 1 West Wilson St, Room 150, Madison WI 53702-0007 or at the Legislative Reference Bureau. The publication may be purchased from the Health Physics Society, 1313 Dolley Madison Blvd., Suite 402, McLean, VA 22101.

(c) Licensee use of an energy compensation source, which may contain quantities no greater than 3.7 MBq (100 microcuries), is exempt from the requirements of this subchapter, except for all the following:

1. A licensee using an ECS in a well with a surface casing for protecting fresh water aquifers shall meet the requirements of subs. (5) to (9).
2. A licensee using an ECS in a well without a surface casing for protecting fresh water aquifers shall meet the requirements of subs. (5) to (9), and ss. DHS 157.51 (1) (a), 157.53 (2) and 157.56.

(d) Licensee use of a tritium neutron generator target source is exempt from the following requirements of this subchapter:

1. A licensee using a tritium neutron generator target source, containing quantities no greater than 1,110 GBq (30 curies), in a well with a surface casing to protect fresh water aquifers is exempt from the requirements of s. DHS 157.56 and this subsection except for pars. (a) and (b) for tritium neutron generator target source use only.

2. A licensee using a tritium neutron generator target source, containing quantities exceeding 1,110 GBq (30 curies), or in a well without a surface casing to protect fresh water aquifers is exempt from the requirements of this subsection except for pars. (a) and (b) for tritium neutron generator target source use only.

(11) LABELING. (a) Each source, source holder or well logging tool containing radioactive material shall bear a durable, legible and clearly visible marking or label which has, as a minimum, the standard radiation caution symbol, without the conventional color requirement, and the following wording:

DANGER (or "CAUTION")
RADIOACTIVE

This label 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 that has, as a minimum, the standard radiation caution symbol and the following wording:

DANGER (or "CAUTION")
RADIOACTIVE

NOTIFY CIVIL AUTHORITIES [OR NAME OF
COMPANY] IF FOUND

(c) Each uranium sinker bar used in well logging applications shall be legibly impressed with the following words:

CAUTION
RADIOACTIVE — DEPLETED URANIUM
NOTIFY CIVIL AUTHORITIES
[OR NAME OF COMPANY] IF FOUND

(12) INSPECTION AND MAINTENANCE. (a) A licensee or registrant shall conduct, at intervals not to exceed 6 months, a program of inspection and maintenance of source holders, well logging tools, source handling tools, storage containers, transport containers and injection tools to assure proper labeling and physical condition. Records of inspection and maintenance shall be maintained for a period of 3 years for inspection by the department.

(b) If any inspection conducted under par. (a) reveals damage to labeling or components critical to radiation safety, the device shall be removed from service until repairs have been made.

(c) If a sealed source is lodged in the source holder, a licensee may not perform any operation such as drilling, cutting or chiseling on the source holder unless the licensee is specifically approved by the NRC, an agreement state or a licensing state to perform the operation.

(d) A licensee may not remove a sealed source from a source holder or logging tool or perform maintenance on sealed sources or holders containing sealed sources unless a written procedure developed under the requirements of s. DHS 157.53 (2) has been approved by the department, the NRC, an agreement state or a licensing state.

(e) A licensee shall visually check source holders, well logging tools and source handling tools for defects prior to each use to ensure that the equipment is in good working condition and that required labeling is present. If defects are found, the licensee shall remove the equipment from service until repaired and a record made listing all of the following:

1. Date of inspection.
2. Name of person conducting the visual inspection.
3. Equipment involved by brand, type and serial number.
4. Defects found.
5. Repairs made.

(f) Records required by par. (e) shall be retained for 3 years after the defect is found.

History: CR 01-108: cr. Register July 2002 No. 559, eff. 8-1-02; CR 06-021: am. (8), r. and recr. (10) (a) to (d), renum. (10) (e) and (f) to be (10) (c) and (d) and am. (10) (c) 2. and (d) 1. and 2. Register October 2006 No. 610, eff. 11-1-06.

DHS 157.53 Requirements for personnel safety. (1) TRAINING REQUIREMENTS. (a) A licensee or registrant may not permit an individual to act as a well logging supervisor until the individual has done all of the following:

1. Completed training incorporating the subjects outlined in ch. DHS 157 Appendix J and demonstrated an understanding of the subject matter by successful completion of a written examination.

2. Read and received instruction in the requirements contained in this subchapter and subchs. I, III and X or their equivalent from another state or the NRC, conditions of appropriate license or certificate of registration and the licensee's or registrant's operating and emergency procedures and demonstrated an understanding of the subject matter by successful completion of a written examination.

3. Completed on the job training and demonstrated competence during actual well logging operations to use sources of radiation, related handling tools and radiation survey instruments that will be used on the job.

(b) A licensee or registrant may not permit an individual to assist in the handling of sources of radiation until the individual has done both of the following:

1. Read or received instruction in the requirements contained in this subchapter and subchs. I, III and X, and the licensee's operating and emergency procedures and demonstrated an understanding of the subject matter by successful completion of an oral or written test.

2. Demonstrated competence to use, under the personal supervision of the well logging supervisor, the sources of radiation, related handling tools and radiation survey instruments that will be used on the job.

(c) A licensee or registrant shall maintain employee training records for inspection by the department for 3 years following termination of the individual's employment.

(d) A licensee or registrant shall provide safety reviews for well logging supervisors and well logging assistants at least once during each calendar year.

(2) OPERATING AND EMERGENCY PROCEDURES. A licensee's or registrant's operating and emergency procedures shall include instructions in at least all of the following:

(a) Handling and use of sources of radiation to be employed so that no individual is likely to be exposed to radiation doses in excess of the standards established in subch. III.

(b) Methods and occasions for conducting radiation surveys.

(c) Methods and occasions for locking and securing sources of radiation.

(d) Personnel monitoring and the use of personnel monitoring equipment.

(e) Transportation of radioactive sources to temporary job sites and field stations, including the packaging and placing of sources of radiation in vehicles, placarding of vehicles and securing sources of radiation during transportation to prevent loss, tampering or unauthorized removal.

(f) Minimizing exposure of individuals in the event of an accident.

(g) Procedure for notifying the proper personnel in the event of an accident.

(h) Maintenance of records.

(i) Use, inspection and maintenance of source holders, well logging tools, source handling tools, storage containers, transport containers, injection tools, sealed sources and uranium sinker bars.

(j) Procedure to be followed in the event a sealed source is lodged in a well-bore.

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

(l) Procedures for using tracers and decontaminating the environment, equipment and personnel.

(m) Maintenance of records generated by well logging personnel at temporary job sites.

(n) Notifying proper persons in the event of an accident.

(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 s. DHS 157.52 (4).

(3) PERSONNEL MONITORING. (a) A licensee or registrant may not permit an individual to act as a well logging supervisor or ~~to assist~~ ~~login assistant~~ in the handling of sources of radiation unless the individual wears ~~either a film badge or a thermoluminescent dosimeter or similar approved device~~ a personnel dosimeter at all times during the handling of licensed radioactive materials. Each ~~film badge or TLD~~ personnel dosimeter shall be assigned to and worn by only one individual. Film badges shall be replaced at least monthly and ~~TLDs~~ all other personnel dosimeters that require replacement shall be replaced at least quarterly. ~~After replacement, each film badge or TLD shall be promptly processed.~~ All personnel dosimeters shall be evaluated at least quarterly or promptly after replacement, whichever is more frequent.

(b) Personnel monitoring records, including bioassay records if required by the license, shall be maintained for inspection until the department authorizes disposition.

History: CR 01-108: cr. Register July 2002 No. 559, eff. 8-1-02; CR 06-021: am. (1) (a) 1. and 2., cr. (1) (d) Register October 2006 No. 610, eff. 11-1-06; CR 09-062: am. (1) (a) 1. Register April 2010 No. 652, eff. 5-1-10; **correction in (1) (a) 1. made under s. 35.17, Stats., Register January 2018 No. 745.**

DHS 157.54 Precautionary procedures. (1) SECURITY. During each well logging or tracer application, the well logging supervisor or other designated employee shall maintain direct surveillance of the operation to protect against unauthorized or unnecessary entry into a restricted area.

(2) HANDLING TOOLS. A licensee shall provide and require the use of tools that will ensure remote handling of sealed sources other than low-activity calibration sources.

(3) 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 job sites.

(b) A licensee may not inject or cause the injection of radioactive material into potable fresh water aquifers without prior written authorization from the department.

History: CR 01-108: cr. Register July 2002 No. 559, eff. 8-1-02; CR 06-021: am. (3) (b) Register October 2006 No. 610, eff. 11-1-06.

DHS 157.55 Radiation surveys and records. (1) RADIATION SURVEYS. (a) 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. 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 well logging tool before departing the jobsite, the well logging tool detector shall be energized, or a survey meter used, to assure that the well logging tool is free of contamination.

(d) Radiation surveys shall be made and recorded at the jobsite or well-head for each sub-surface tracer study. Surveys shall include measurements of radiation levels before and after the operation.

(e) Records required under pars. (a) to (d) shall include the dates, the identification of individuals making the survey, the identification of survey instruments used and an exact description of the location of the survey. Records of these surveys shall be maintained for inspection by the department for 3 years after completion of the survey.

(2) DOCUMENTS AND RECORDS REQUIRED AT FIELD STATIONS. A licensee or registrant shall maintain, for inspection by the department, all of the following documents and records for the specific devices and sources used at the field station:

- (a) Appropriate license, certificate of registration or equivalent documents.
- (b) Operating and emergency procedures.
- (c) Subchs. I, III, V and X.
- (d) Records of the latest survey instrument calibrations under s. DHS 157.52 (4).
- (e) Records of the latest leak test results under s. DHS 157.52 (5) and (6).
- (f) Records of quarterly inventories under s. DHS 157.52 (8).
- (g) Utilization records under s. DHS 157.52 (9).
- (h) Records of inspection and maintenance under s. DHS 157.52 (12).
- (i) Survey records under sub. (1).
- (j) Training records under s. DHS 157.53 (1).

(3) DOCUMENTS AND RECORDS REQUIRED AT TEMPORARY JOB SITES. A licensee or registrant conducting operations at a temporary jobsite shall have all the following documents and records available at the temporary jobsite for inspection by the department:

- (a) Operating and emergency procedures.
- (b) Survey records required under sub. (1) for the period of operation at the jobsite.
- (c) Evidence of current calibration for the radiation survey instruments in use at the jobsite.
- (d) During operation in the state under reciprocity, a copy of the appropriate license, certificate of registration or equivalent documents.
- (e) Shipping papers for the transportation of radioactive material.

History: CR 01-108: cr. Register July 2002 No. 559, eff. 8-1-02; CR 06-021: am. (1) (d) Register October 2006 No. 610, eff. 11-1-06.

DHS 157.56 Notification of incidents, abandonment and lost sources. (1) PROVISIONS. Notification of incidents, and sources of radiation lost in other than well logging operations, shall be made under appropriate provisions of subch. III.

(2) INITIAL ACTIONS. Whenever a sealed source or device containing radioactive material is lodged in the well-bore or may have ruptured and caused contamination, a licensee shall do all the following:

- (a) Monitor at the surface for the presence of radioactive contamination with a radiation survey instrument or well logging tool during recovery operations.
- (b) Notify the department immediately by telephone and subsequently, within 30 days, by confirmatory letter if the licensee knows or has reason to believe that a sealed source has been ruptured. The confirmatory letter shall identify the well or other location, describe the magnitude and extent of the escape of radioactive material, assess the consequences of the rupture and explain efforts planned or being taken to mitigate these consequences.

Note: The department may be contacted at: 608-267-4797 during normal business hours of 7:45 am to 4:30 pm, Monday through Friday, except state holidays, and other times at 608-258-0099.

(3) UNSUCCESSFUL RECOVERY. When it becomes apparent that efforts to recover the radioactive source will not be successful, a licensee shall do all the following within 30 days of making the determination that source recovery is not possible or request an extension from the department:

- (a) Advise the well operator of the requirements contained in this section and an appropriate method of abandonment, which shall include all the following:
 1. Immobilization and sealing in place of the radioactive source with a cement plug.
 2. Setting of a deflection device.
 3. Mounting of a permanent identification plaque at the surface of the well, containing the information required by sub. (4).
- (b) Notify the department by telephone within 24 hours, giving the circumstances of the loss and request approval of the proposed abandonment procedures.
- (c) File a written report with the department within 30 working days of the abandonment. A licensee shall send a copy of the report to the department of natural resources bureau that issued permits or otherwise approved of the drilling operation. The report shall contain all the following information:
 1. Date of occurrence.
 2. A description of the well logging source involved, including the radionuclide and its quantity, chemical and physical form.
 3. Surface location and identification of the 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 source.
 7. Depth of the top of the cement plug.
 8. Depth of the well.
 9. Any other information, such as a warning statement, contained on the permanent identification plaque.
 10. The names of state agencies receiving a copy of the report.

Note: Written reports and requests for extensions may be mailed to the department at the following address: Department of Health Services, Radiation Protection Section, PO Box 2659, Madison, WI, 53701-2659. The telephone contact number is: 608-267-4797 during normal business hours and 608-258-0099 after hours.

(4) POSTING. Whenever a sealed source containing radioactive material is abandoned in a well a licensee shall post a permanent plaque, as described in ch. DHS 157 Appendix K, at the surface of the well. The plaque shall be constructed of long-lasting material, such as stainless steel or monel, and contain all the following information engraved on its face:

- (a) The word "CAUTION".
- (b) The radiation symbol without the conventional color requirement.
- (c) The date of abandonment.
- (d) The name of the well operator or well owner.
- (e) The well name and well identification number or numbers or other designation.
- (f) The sealed source or sources by radionuclide and activity.
- (g) The source depth and the depth to the top of the plug.
- (h) An appropriate warning, depending on the specific circumstances of each abandonment.

Note: 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 Department of Health Services, Radiation Protection Section".

(5) LOSS IN POTABLE FRESH WATER AQUIFER. A licensee shall immediately notify the department by telephone and within 24 hours by confirming letter if the licensee knows or has reason to believe that radioactive material has been lost in or to an underground potable fresh water aquifer. The notice shall designate the well location, 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.

Note: The department may be contacted at: Department of Health Family Services, Radiation Protection Section, P.O. Box 2659, Madison, WI, 53701-2659. Telephone contact is: 608-267-4797 during normal business hours or 608-258-0099 after hours.

History: CR 01-108: cr. Register July 2002 No. 559, eff. 8-1-02; CR 06-021: am. (4) (intro.) and (5) Register October 2006 No. 610, eff. 11-1-06; **correction in (4) (intro.) made under s. 35.17, Stats., Register January 2018 No. 745.**