

1 DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

2 Hazardous Materials and Waste Management Division

3 ~~RADIATION CONTROL - RADIATION SAFETY REQUIREMENTS FOR WELL LOGGING WIRELINE~~
4 ~~SERVICE OPERATIONS AND SUBSURFACE TRACER STUDIES~~

5 6 CCR 1007-1 Part 16

6 Adopted by the Board of Health July 20, 2016

7 [Editor's Notes follow the text of the rules at the end of this CCR Document.]

8
9 PART 16: RADIATION SAFETY REQUIREMENTS FOR WELL LOGGING WIRELINE SERVICE
10 OPERATIONS AND SUBSURFACE TRACER STUDIES

11 16.1 Purpose and Scope.

12 16.1.1 Authority.

13 Rules and regulations set forth herein are adopted pursuant to the provisions of Sections 25-1-
14 108, 25-1.5-101(1)(l), and 25-11-104, CRS.

15 16.1.2 Basis and Purpose.

16 A statement of basis and purpose accompanies this part and changes to this part. A copy may be
17 obtained from the Department.

18 16.1.3 Scope.

19 The regulations in this part establish radiation safety requirements for use of sources of
20 radiation or licensed materials including sealed sources, radioactive tracers, radioactive
21 markers, and uranium sinker bars in well logging in a single well. This part also prescribes
22 radiation safety requirements for persons using sources of radiation or licensed materials
23 in these operations. ~~using sources of radiation for wireline service operations including mineral-~~
24 ~~logging, radioactive markers, and subsurface tracer studies.~~

25 16.1.4 Applicability.

26 The regulations in this part apply to all applicants, licensees or registrants who use sources of
27 radiation for well logging or wireline service operations including mineral-logging, radioactive
28 markers, or subsurface tracer studies. The requirements of this part are in addition to, and not in
29 substitution for, the requirements of Parts 1, 2, 3, 4, 8, 10, 17, and 4022 of these regulations.

30 16.1.5 Published Material Incorporated by Reference.

31 Published material incorporated in Part 16 by reference is available in accord with Part 1, Section
32 1.4.

33 16.2 Definitions.

34 As used in this part, these terms have the definitions set forth as follows.

Comment [jsj1]:
EDITORIAL NOTE 1: ALL COMMENTS (SUCH AS THIS ONE) SHOWN IN THE RIGHT SIDE MARGIN OF THIS DOCUMENT ARE FOR INFORMATION PURPOSES ONLY TO ASSIST THE READER IN UNDERSTANDING THE PROPOSED RULE DURING THE DRAFT REVIEW AND COMMENT PROCESS.

THESE COMMENTS ARE NOT PART OF THE RULE AND ALL COMMENTS WILL BE DELETED PRIOR TO FINAL PUBLICATION.

EDITORIAL NOTE 2: ALIGNMENT AND FORMATTING CORRECTIONS AND ADJUSTMENTS ARE MADE THROUGHOUT THE RULE AND MAY NOT BE SPECIFICALLY IDENTIFIED WITH A SIDE MARGIN COMMENT.

EDITORIAL NOTE 3: THE ACRONYM "CRCPD" REFERS TO THE CONFERENCE OF RADIATION CONTROL PROGRAM DIRECTORS (CRCPD), INC., WHICH DEVELOPS SUGGESTED STATE REGULATIONS FOR CONTROL OF RADIATION (KNOWN AS SSRCR'S). UNLESS OTHERWISE DETERMINED BY THE BOARD OF HEALTH, COLORADO'S RULES ARE TO BE CONSISTENT WITH BOTH NUCLEAR REGULATORY COMMISSION (NRC) REGULATIONS AND THE SSRCR REGULATIONS. DUE TO DIFFERING RULE LANGUAGE BETWEEN THE NRC RULE(S) AND THE SSRCR, IT MAY NOT BE POSSIBLE TO BE CONSISTENT WITH BOTH NRC AND CRCPD. THESE DIFFERENCES HAVE BEEN IDENTIFIED IN THE SIDE MARGIN NOTES WHEREVER POSSIBLE.

THE SSRCRS MAY BE FOUND ONLINE AT: <http://www.crcpd.org/ssrcrs/default.aspx>
THE ORIGINAL PART 16 RULE IS BASED ON CRCPD SSRCR PART "W" DATED 1991.

Comment [jsj2]: A change in the title of the rule is proposed. Well logging is a more current term.

The "well logging" term is also more consistent with the title of 10 CFR Part 39 ("Licenses and radiation safety requirements for well logging").

Comment [JJ3]: This reflects the date of anticipated approval by the Colorado Board of Health and is subject to change. The effective date is approximately 60 days beyond this date, pending additional review and approvals.

Comment [jsj4]: Language added in 16.1.3 and 16.1.4, to be consistent with rule title change, and language of 10 CFR 39.1.

Comment [JJ5]: Cross-reference to additional regulatory parts consistent with 10 CFR Part 39.1. References to Part 8 (x-ray non-healing arts); Parts 10 (notices...); 17 (transportation) and Part 22 (physical security) are added. NRC RATS 2013-1; NRC Compatibility = D

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

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

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

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

45 "Logging assistant" means any individual who, under the personal supervision of a logging
46 | supervisor, handles sealed sources or tracers that are not in logging tools or shipping containers
47 | or who performs surveys required by 16.22.

48 "Logging supervisor" means ~~an~~the individual who uses sources of radiation or provides personal
49 | supervision ~~in the use of sources of radiation at a temporary jobsite of the utilization of~~
50 | ~~sources of radiation at the well site and who is responsible to the licensee for assuring~~
51 | ~~compliance with the requirements of the Department's regulations and the conditions of~~
52 | ~~the license~~.

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

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

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

59 "Radioactive marker" means radioactive material placed subsurface or on a structure intended for
60 | subsurface use for the purpose of depth determination or direction orientation. **For purposes of**
61 | **this part, this term includes radioactive collar markers and radioactive iron nails.**

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

66 "Source holder" means a housing or assembly into which a radioactive source is placed for the
67 | purpose of facilitating the handling and use of the source in well-logging operations.

68 "Subsurface tracer study" means the release of a substance tagged with radioactive material for
69 | the purpose of tracing the movement or position of the tagged substance in the well-bore or
70 | adjacent formation.

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

73 "Temporary jobsite" means a location where radioactive materials are present for the purpose of
74 | performing ~~wireline service operations~~well logging or subsurface tracer studies.

Comment [jsj6]: "Logging supervisor" definition is updated, consistent with the same definition in 10 CFR 39.2. The proposed language includes the term "sources of radiation" in lieu of "licensed material" since Agreement States regulate both radiation producing machines and radioactive materials.

The added language explicitly expands the responsibilities of the logging supervisor.

The proposed definition differs from SSRRC W (1991) but is more consistent with federal rule.

NRC Compatibility = C

Comment [jsj7]: "logging" is added for clarity.

NRC Compatibility = D

Comment [jsj8]: Definition is updated, consistent with the same definition in 10 CFR 39.2. The proposed sentence adds clarification.

The proposed definition differs from SSRRC W (1991) but is more consistent with federal rule.

NRC Compatibility = D

Comment [jsj9]: Definition added for clarity. The definition is consistent with 10 CFR 39.2.

The phrase is used within Part 16.

There is no equivalent definition in SSRRC W (1991).

NRC Compatibility = D

Comment [jsj10]: Definition updated for clarity. The modified definition is consistent with 10 CFR 39.2.

Well logging is a more broad/general term, whereas wireline is more specific to the use of a wire for lowering the source of radiation downhole. Current logging technologies allow for logging while drilling in which the source is part of the drill or logging tool, whereas wireline activities are typically performed after a hole is drilled. Both technologies are in use.

The proposed definition differs from SSRRC W (1991) but is more consistent with federal rule language.

NRC Compatibility = D

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

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

79 "~~Well-bore~~" means a drilled hole in which ~~wireline service operations~~ **well logging** and subsurface
80 tracer studies are performed. **As used in this part, "well" includes drilled holes for the**
81 **purpose of oil, gas, mineral, groundwater, or geological exploration.**

Comment [jsj11]: The definition "well-bore" is modified to "well", and language is added, consistent with the "well" definition in 10 CFR 39.2.

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

Subsequent use of the phrase "well-bore" in 16.2 definitions is changed to "well" for consistency.

The proposed definition/language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility (for "well" definition) = D

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

Comment [jsj12]: The definition "well-logging" is updated, consistent with the same definition in 10 CFR 39.2.

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

The proposed definition differs from SSRCR W (1991) but is more consistent with federal rule. NRC Compatibility = C

90 **16.3 Specific licenses for well logging.**

91 **16.3.1 The Department will approve an application for a specific license for the use of radioactive**
92 **material in well logging if the applicant meets the following requirements:**

Comment [JJ13]: Section 16.3 numbering was previously omitted from the rule.

93 **16.3.1.1 The applicant shall satisfy the general requirements specified in 3.9, 3.9.1, 3.9.2,**
94 **3.9.4 and 3.9.7 for byproduct and source material, and in 10 CFR 70.23 for special**
95 **nuclear material, as appropriate, and any special requirements contained in this**
96 **part.**

Section 16.3 and subsections are added for consistency with 10 CFR 39.13. NRC Compatibility = H&S

97 **16.3.1.2 The applicant shall develop a program for training logging supervisors and**
98 **logging assistants and submit to the Department a description of this program**
99 **which specifies the:**

Comment [jsj14]: Cross-references are expanded for consistency with the expanded cross-references in 10 CFR 39.13.

This provision is expanded for consistency with federal rules and differs from SSRCR W which is not current with federal rule.

NRC RATS 2011-2
NRC Compatibility (39.13)= H&S

100 (1) Initial training;

101 (2) On-the-job training;

102 (3) Annual safety reviews (refresher training) provided by the licensee;

Comment [jsj15]: The phrase "refresher training" is added for clarity so it is not confused with the annual audit or inspection of logging supervisors and assistants, which is a separate requirement.

103 (4) Means the applicant will use to demonstrate the logging supervisor's
104 knowledge and understanding of and ability to comply with the
105 Department's regulations and licensing requirements and the applicant's
106 operating and emergency procedures; and

Appendix D of NRC NUREG-1556, Vol. 14 similarly clarifies that the safety reviews refer to the annual refresher training.

107 (5) Means the applicant will use to demonstrate the logging assistant's
108 knowledge and understanding of and ability to comply with the applicant's
109 operating and emergency procedures.

Comment [jsj16]: The proposed provision differs slightly from that in 10 CFR 39.13. The CFR includes language which allows submission of an outline or summary of the procedures rather than submission of the actual procedures. As a matter of practice, the Radiation Program has and continues to require submission of complete procedures and therefore submission of an outline of procedures is not allowed.

NRC Compatibility = H&S

110 **16.3.1.3 The applicant shall submit to the Department written operating and emergency**
111 **procedures as described in 16.16 that includes the important radiation safety**
112 **aspects of the procedures.**

113

- 114 **16.3.1.4** The applicant shall establish and submit to the Department its program for
115 annual inspections of the job performance of each logging supervisor and well
116 logging assistant to ensure that the Department's regulations, license
117 requirements, and the applicant's operating and emergency procedures are
118 followed. Inspection records must be retained for 3 years after each annual
119 internal inspection.
- 120
- 121 **16.3.1.5** The applicant shall submit a description of its overall organizational structure as
122 it applies to the radiation safety responsibilities in well logging, including
123 specified delegations of authority and responsibility.
- 124
- 125 **16.3.1.6** If an applicant wants to perform leak testing of sealed sources, the applicant
126 shall identify the manufacturers and the model numbers of the leak test kits to be
127 used. If the applicant wants to analyze its own wipe samples, the applicant shall
128 establish procedures to be followed and submit a description of these
129 procedures to the Department. The description must include the:
- 130
- 131 (1) Instruments to be used;
- 132
- 133 (2) Methods of performing the analysis; and
- 134
- 135 (3) Pertinent experience of the person who will analyze the wipe samples.

Comment [jsj17]: The proposed provision includes the well logging assistant which differs slightly from the language in 10 CFR 39.13.

The CFR explicitly specifies the annual inspection of well logging supervisors. However, NRC guidance – including a model/example checklist – includes the well logging assistant. The proposed addition of the logging assistant clarifies that the annual inspection requirement applies to well logging supervisors and well logging assistants.

NRC Compatibility = H&S

136 **PROHIBITION**

- 137 **16.4** ~~Prohibition~~Agreement with well owner or operator.
- 138 **16.4.1** ~~No licensee shall perform wireline service operations with a sealed source(s) unless, prior to~~
139 ~~commencement of the operation, the licensee has a written agreement with the well operator,~~
140 ~~well owner, drilling contractor, or land owner that:~~ **A licensee may perform well logging with a**
141 **sealed source only after the licensee has a written agreement with the employing well**
142 **owner or operator. This written agreement must identify who will meet the following**
143 **requirements:**
- 144 **16.4.1.1** In the event a sealed source is lodged downhole, a reasonable effort ~~at recovery~~
145 will be made ~~to recover it.~~ **to recover it.** ~~and~~
- 146 **16.4.1.2** **A person may not attempt to recover a sealed source in a manner which, in**
147 **the licensee's opinion, could result in its rupture.**
- 148 **16.4.1.3** **The radiation monitoring required in 16.22.7 will be performed.**
- 149 **16.4.1.4** **If the environment, any equipment, or personnel are contaminated with**
150 **radioactive material, they must be decontaminated before release from the**
151 **site or release for unrestricted use; and**
- 152 **16.4.2.1.5** ~~In the event a decision is made to abandon the sealed source downhole, the~~
153 ~~requirements of 16.25 and of any other State agency having applicable~~
154 ~~regulations shall be met.~~ **If the sealed source is classified as irretrievable after**
155 **reasonable efforts at recovery have been expended, the requirements of**
156 **16.25.3.2 must be implemented within 30 days.**
- 157 **16.4.2** **The licensee shall retain a copy of the written agreement for 3 years after the completion**
158 **of the well logging operation.**

Comment [jsj18]: Section title is updated consistent with the title in 10 CFR 39.15.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

Comment [jsj19]: Section 16.4 (and subsections) are modified, consistent with 10 CFR 39.15

The proposed language prescribes additional requirements beyond those currently specified, although they are generally consistent with prudent radiation safety practices or other requirements of these regulations.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.15) = C

159 **16.4.3** A licensee may apply, pursuant to 1.5.1, for Department approval, on a case-by-case basis,
160 of proposed procedures to abandon an irretrievable well logging source in a manner not
161 otherwise authorized in 16.4.1.5.

Comment [jsj20]: This provision, consistent with 10 CFR 39.15(c), will allow a licensee alternatives for abandonment procedures on a case by case basis.

162 **16.4.4** A written agreement between the licensee and the well owner or operator is not required if
163 the licensee and the well owner or operator is part of the same corporate structure or
164 otherwise similarly affiliated. However, the licensee shall still otherwise meet the
165 requirements in 16.4.1.1 through 16.4.1.5.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.15) = C

Comment [jsj21]: This provision, consistent with 10 CFR 39.15(d), provides an exception when the logging licensee is under the same corporate structure as the well owner.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.15) = C

166 EQUIPMENT CONTROL

167 16.5 Limits on Levels of Radiation.

168 Sources of radiation shall be used, stored, and transported in such a manner that the
169 transportation requirements of Part 17 and the dose limitation requirements of Part 4 of these
170 regulations are met.

171 16.6 Storage Precautions.

172 **16.6.1** Each source of radiation, except an accelerator, shall be provided with a storage or transport
173 container. The container shall be provided with a lock, or tamper seal for calibration sources, to
174 prevent unauthorized removal of, or exposure to, the source of radiation. The licensee shall
175 store each source of radiation, except an accelerator, in a storage container or
176 transportation package.

Comment [jsj22]: Provision amended, consistent with 10 CFR 39.31(b)(1). The proposed language provides more explicit requirements for securing a container in storage.

The phrases "except an accelerator" and "or exposure to" are retained.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.31(b)) = C

177 **16.6.1.1** The container or package must be locked and physically secured to
178 prevent tampering or removal of (or exposure to) radiation sources from
179 storage by unauthorized personnel.

180 **16.6.2.2** Sources of radiation shall be stored in a manner which will minimize danger from
181 explosion or fire.

182 16.7 Transport Precautions.

183 **16.7.1** The licensee shall lock and transport containers shall be physically secured to the transport
184 package containing radioactive material in the transporting vehicle to prevent accidental loss,
185 tampering, or unauthorized removal of the radioactive material from the vehicle.

Comment [jsj23]: Provision amended, consistent with 10 CFR 39.31(b)(2). The proposed language provides more explicit requirements for securing a transportation package in the transport vehicle.

186 16.8 Radiation Survey Instruments.

187 16.8.1 The licensee or registrant shall keep a calibrated and operable radiation survey instrument
188 capable of detecting beta and gamma radiation at each field station and temporary jobsite to
189 make the radiation surveys required by this part and by Part 4 of these regulations. To satisfy this
190 requirement, the radiation survey instrument must be capable of measuring 0.001 mSv (0.1
191 mrem) per hour through at least 0.5 mSv (50 mrem) per hour.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.31(b)) = C

192 **16.8.2** The licensee shall have available additional calibrated and operable radiation detection
193 instruments sensitive enough to detect the low radiation and contamination levels that
194 could be encountered if a sealed source is ruptured. The licensee may own the
195 instruments or may have a procedure to obtain them quickly from a second party.

Comment [jsj24]: Provision added, consistent with 10 CFR 39.33(b). The proposed language requires additional survey instruments to be available in the event of a ruptured source.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.33(b)) = H&S

196 **16.8.23** Each radiation survey instrument shall be calibrated:

197 **16.8.23.1** At intervals not to exceed 6 months and after each instrument servicing;

- 198 16.8.23.2 For linear scale instruments, at two points located approximately 1/3 and 2/3 of
199 full-scale on each scale; for logarithmic scale instruments, at midrange of each
200 decade, and at two points of at least one decade; and for digital instruments, at
201 appropriate points; and
- 202 16.8.23.3 So that accuracy within 20 percent of the true radiation level can be
203 demonstrated on each scale.
- 204 16.8.34 Calibration records shall be maintained for a period of 23 years after the date of calibration for
205 inspection by the Department.
- 206 **16.9 Leak Testing of Sealed Sources.**
- 207 **16.9.1 Requirements.**
- 208 Each licensee ~~who uses~~ a sealed source of radioactive material shall have the sources
209 tested for leakage periodically. ~~Records of leak test results shall be kept in units of becquerel~~
210 ~~(Bq) (or microcurie, µCi) and maintained for inspection by the Department for 6 months after the~~
211 ~~next required leak test is performed or until transfer or disposal of the sealed source. The~~
212 ~~licensee shall keep a record of leak test results in units of becquerel (Bq) or microcurie~~
213 ~~(uCi) and retain the record for inspection by the Department for 3 years after the leak test~~
214 ~~is performed.~~
- 215 **16.9.2 Method of Testing.**
- 216 16.9.2.1 Tests for leakage shall be performed using a leak test kit or method approved by
217 the Department, the ~~U.S. Nuclear Regulatory Commission~~ NRC, or an Agreement
218 State, ~~or a Licensing State.~~
- 219 16.9.2.2 The **wipe** test sample shall be taken from the nearest accessible point to the
220 surface of the sealed source where contamination is likely to accumulate.
- 221 16.9.2.3 The **wipe** test sample shall be analyzed for radioactive contamination.
- 222 16.9.2.4 The analysis shall be capable of detecting the presence of 185 Bq (0.005
223 microcurie) of radioactive material on the **wipe** test sample and must be
224 performed by a person specifically approved by the Department, the ~~U.S.~~
225 ~~Nuclear Regulatory Commission~~ NRC, or an Agreement State, ~~or a Licensing~~
226 ~~State~~ to perform the analysis.
- 227 **16.9.3 Interval of Testing.**
- 228 16.9.3.1 Each sealed source of radioactive material (except an energy compensation
229 source (ECS)) shall be tested at intervals not to exceed 6 months. In the absence
230 of a certificate from a transferor indicating that a test has been made within 6
231 months prior to the transfer, the sealed source shall not be used until tested.
- 232 16.9.3.2 Each ECS that is not exempt from testing in accordance with 16.9.5 must be
233 tested at intervals not to exceed 3 years. In the absence of a certificate from a
234 transferor indicating that a test has been made within the 3 years prior to the
235 transfer, the ECS shall not be used until tested.
- 236 **16.9.4 Leaking or Contaminated Sources.**

Comment [JJ25]: Here and throughout other sections of the rule, the record retention requirement is changed from 2 years to 3 years, consistent with federal rule in 10 CFR 39.33(d).

The current inspection frequency for well logging licensees is 3 years. Allowing for a 3 year record retention period brings consistency between the records availability and the inspection cycle.

The current record retention cycle in SSRCR W is 2 years. The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

Comment [JJ26]: The proposed language is updated for consistency with 10 CFR 39.35(a).

The proposed language will require that licensees retain leak test requirements for a period of 3 years rather than the current 1 year period (~6 months beyond the next required leak test). Licensees regulated under Part 16 are inspected at a frequency of 3 years. The proposed change better aligns the record retention period with the inspection frequency to afford the opportunity to inspect these records over a longer period.

The language of the current rule (without the proposed changes) is consistent with SSRCR W.105a (1991). Implementing the proposed language would make the rule consistent with federal rule but would differ from SSRCR W.

NRC Compatibility = C

Comment [jsj27]: The language is updated for consistency with 10 CFR 39.35.

The term "Licensing state" is no longer being used in the regulatory scheme.

NRC Compatibility = C

Comment [jsj28]: The phrase "wipe" is added here and in other section for technical clarity and consistency with 10 CFR 39.35.

Radioactive sources are most commonly tested for leakage via collection of a wipe test.

NRC Compatibility = C

237 If, for any reason, it is suspected that a sealed source may be leaking, it shall be removed from
238 service immediately and tested for leakage as soon as practical.

239 16.9.4.1 If the **wipe** test reveals the presence of 185 Bq (0.005 microcurie) or more of
240 removable radioactive material, the licensee shall immediately withdraw the
241 source from use and shall cause it to be decontaminated and repaired, or
242 disposed of, by a licensee authorized by the Department, ~~the NRC, U.S. Nuclear~~
243 ~~Regulatory Commission, or Agreement State, or a Licensing State~~ to perform
244 these functions.

245 16.9.4.2 The licensee shall check the equipment associated with the leaking source for
246 radioactive contamination and, if contaminated, have it decontaminated or
247 disposed of by a licensee authorized by the Department, ~~U.S. Nuclear~~
248 ~~Regulatory Commission, NRC, or Agreement State, or a Licensing State~~ to
249 perform these functions.

250 ~~16.9.4.3~~ **The licensee shall submit a report to the Department within 5 days of**
251 **receiving the test results. The report must describe** the equipment involved
252 **in the leak, the test results, any contamination which resulted from the**
253 **leaking source, and the corrective action taken up to the time the report is**
254 **made shall be filed with the Department within 5 days of receiving the test**
255 **results.**

Comment [jsj29]: The language is updated/rephrased for consistency with 10 CFR 39.35(d).

The proposed language differs from SSR W (1991) but is more consistent with federal rule.

NRC Compatibility = C

256 ~~16.9.5~~ Exemptions **from testing requirements.**

Comment [jsj30]: Section title updated for consistency with 10 CFR 39.35(e).

NRC Compatibility = C

257 The following sources are exempted from the periodic leak test requirements of 16.9.1 through
258 16.9.4:

259 16.9.5.1 Hydrogen-3 (tritium) sources;

260 16.9.5.2 Sources of radioactive material with a half-life of 30 days or less;

261 16.9.5.3 Sealed sources of radioactive material in gaseous form;

262 16.9.5.4 Sources of beta- or gamma-emitting radioactive material with an activity of 3.7
263 MBq (100 microcuries) or less; and

264 16.9.5.5 Sources of alpha- ~~or~~ **neutron** emitting radioactive material with an activity of 0.37
265 MBq (10 microcuries) or less.

Comment [JJ31]:

Consistent with 10 CFR 39.35(e), the periodic leak test exemption is expanded to low activity neutron sources, based on a prior licensee (stakeholder) inquiry/request.

The proposed language differs from SSR W (1991) but is more consistent with federal rule.

266 **16.10 Quarterly Physical Inventory.**

267 ~~16.10.1~~ Each licensee or registrant shall conduct a ~~quarterly~~**semi-annual** physical inventory to account
268 for all sources of radiation **received and possessed under the license.**

Comment [jsj32]: Consistent with 10 CFR 39.37, the periodic physical inventory frequency is decreased from a quarterly to a semi-annual requirement and language is modified for clarity.

269 16.10.2 Records of inventories shall be maintained for **23** years from the date of the inventory for
270 inspection by the Department and shall include:

271 **16.10.2.1** ~~†~~The quantities and kinds of sources of radiation;;

272 **16.10.2.2** ~~†~~The location where sources of radiation are assigned;;

273 **16.10.2.3** ~~†~~The date of the inventory;; and

274 **16.10.2.4** ~~†~~The name of the individual conducting the inventory.

The proposed language provides for some regulatory relief by requiring an inventory on a less frequent basis.

The proposed language differs from SSR W (1991) but is more consistent with federal rule.

NRC Compatibility = H&S

275 **16.10.3 Physical inventory records may be combined with leak test records.**

276 **16.11 Utilization Records of material use.**

277 16.11.1 Each licensee or registrant shall maintain current records **for each use of sources of radiation**
278 **which shall include:** ~~which shall be kept available for inspection by the Department for 23 years~~
279 ~~from the date of the recorded event.~~

280 ~~16.11.2 The records shall show the following information for each source of radiation:~~

281 16.11.21.1 **The M**ake, model number, and a serial number or a description of each source
282 of radiation used;

283 **16.11.1.2 In the case of unsealed radioactive material used for subsurface tracer**
284 **studies and radioactive markers, the radionuclide and quantity of activity**
285 **used in a particular well and the disposition of any unused tracer materials;**

286 16.11.21.23 The identity of the well-logging supervisor **who is responsible for the licensed**
287 **material and the identity of logging assistants present;** ~~or field unit to whom~~
288 ~~assigned;~~ and

289 16.11.21.34 **The L**ocations **and date of use of the sources of radiation** ~~where used and~~
290 ~~dates of use.~~

291 ~~16.11.3 In the case of tracer materials and radioactive markers, the utilization record shall indicate the~~
292 ~~radionuclide and activity used in a particular well.~~

293 **16.11.2 The licensee shall make the records required by 16.11.1 available for inspection by the**
294 **Department. The licensee shall retain the records for 3 years from the date of the recorded**
295 **event.**

296 **16.12 Design, Pperformance, and Ccertification Ccriteria for Ssealed Ssources Uused in**
297 **Ddownhole Ooperations.**

298 16.12.1 Each sealed source, except energy compensation sources (ECS) and those containing
299 radioactive material in gaseous form, used in downhole operations and manufactured after
300 December 30, 1986, shall be certified by the manufacturer, or other testing organization
301 acceptable to the Department, to meet the following minimum criteria:

302 16.12.1.1 Be of doubly encapsulated construction;

303 16.12.1.2 Contain radioactive material whose chemical and physical forms are as insoluble
304 and non-dispersible as practical; and

305 16.12.1.3 Satisfies the requirements of 16.12.3.1, 16.12.3.2, or 16.12.3.3, as appropriate.

306 16.12.2 For sealed sources, except those containing radioactive material in gaseous form, acquired after
307 December 30, 1986, in the absence of a certificate from a transferor certifying that an individual
308 sealed source meets the requirements of 16.12.1, the sealed source shall not be put into use until
309 such determinations and testing have been performed.

310 16.12.3 Each sealed source, except energy compensation sources (ECS) and those containing
311 radioactive material in gaseous form, used in downhole operations after December 30, 1986,
312 shall be certified by the manufacturer, or other testing organization acceptable to the Department,
313 as meeting the sealed source performance requirements for oil well-logging:

Comment [jsj33]: The provisions of 16.11 (and subsections) have been updated for consistency with 10 CFR 39.39.

The proposed language will require some minor additional actions for licensees using unsealed radioactive materials. Specifically, the disposition of unused materials will be required to be documented under the proposed rule language.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility = C

Comment [jsj34]: Deleted language has been relocated to 16.11.2, consistent with the formatting of 10 CFR 39.39.

Comment [jsj35]: The requirements of this provision have been incorporated into 16.11.1.2 (above).

- 314 16.12.3.1 For a sealed source manufactured on or before July 14, 1989, a licensee may
315 use the sealed source, for use in well logging applications, if it meets the
316 requirements of United States Of America Standards Institute (USASI) N5.10-
317 1968, "Classification of Sealed Radioactive Sources" (1968), or the requirements
318 in 16.12.3.2 or 16.12.3.3.
- 319 16.12.3.2 For a sealed source manufactured after July 14, 1989, a licensee may use the
320 sealed source, for use in well logging applications, if it meets the oil well logging
321 requirements of American National Standards Institute / Health Physics Society
322 (ANSI/HPS) N43.6-1997, "Sealed Radioactive Sources Classification"
323 (November 1997).
- 324 16.12.3.3 For a sealed source manufactured after July 14, 1989, a licensee may use the
325 sealed source, for use in well logging applications, if the sealed source's
326 prototype has been tested and found to maintain its integrity after each of the
327 following tests:
- 328 (1) Temperature test. The test source must be held at 40°C for 20 minutes, 600°C for
329 1 hour, and then be subject to a thermal shock test with a temperature drop from
330 600°C to 20°C within 15 seconds.
- 331 (2) Impact test. A 5-kg steel hammer, 2.5 cm in diameter, must be dropped from a
332 height of 1 m onto the test source.
- 333 (3) Vibration test. The test source must be subject to a vibration from 25 Hz to 500
334 Hz at 5 g amplitude for 30 minutes.
- 335 (4) Puncture test. A 1-gram hammer and pin, 0.3 cm pin diameter, must be dropped
336 from a height of 1 m onto the test source.
- 337 (5) Pressure test. The test source must be subject to an external pressure of 1.695 x
338 10⁷ pascal [24,600 pounds per square inch absolute].
- 339 16.12.4 Certification documents shall be maintained for inspection by the Department for a period of **23**
340 years after source disposal. If the source is abandoned downhole, the certification documents
341 shall be maintained until the Department authorizes disposition.
- 342 16.12.5 Use of an energy compensation source (ECS) is subject to this part, except that if the ECS is
343 contained within a logging tool, or other tool components, and contains quantities of licensed
344 material not exceeding 3.7 MBq (100 microcurie), the ECS is only subject to the requirements:
- 345 16.12.5.1 Of 16.9, 16.10 and 16.11 for well logging applications with a surface casing for
346 protecting fresh water aquifers; or
- 347 16.12.5.2 Of 16.9, 16.10, 16.11, 16.12 and 16.25 for well logging applications without a
348 surface casing for protecting fresh water aquifers.
- 349 ~~16.12.6 Use of a tritium neutron generation target source is subject to this part, except the requirements:~~
- 350 ~~16.12.6.1 Of 16.12 and 16.25 do not apply for use of a tritium neutron generation target~~
351 ~~source containing quantities not exceeding 1,110 MBq (30 curie) and in a well~~
352 ~~with a surface casing for protecting fresh water aquifers; and~~

Comment [jsj36]: Section 16.12.6 is replaced by new sections 16.12.6 and 16.12.7 using language consistent with 10 CFR 39.55.

353 ~~16.12.6.2~~ ~~Of 16.12 do not apply for use of a tritium neutron generation target source~~
354 ~~containing quantities exceeding 1,110 MBq (30 curie) or in a well without a~~
355 ~~surface casing for protecting fresh water aquifers.~~

356 **16.12.6 Use of a tritium neutron generator target source, containing quantities not exceeding 1,110**
357 **GBq (30 curies) and in a well with a surface casing to protect fresh water aquifers, is**
358 **subject to the requirements of Part 16 except Sections 16.4, 16.12, and 16.25.**

359 **16.12.7 Use of a tritium neutron generator target source, containing quantities exceeding 1,110**
360 **GBq (30 curies) or in a well without a surface casing to protect fresh water aquifers, is**
361 **subject to the requirements of Part 16 except Section 16.12.**

362 **16.13 Labeling.**

363 **16.13.1 The licensee may not use a ~~Each~~ source, source holder, or logging tool containing radioactive**
364 **material ~~unless the smallest component that is transported as a separate piece of~~**
365 **equipment with the radioactive material inside ~~shall bears~~ a durable, legible, and clearly**
366 **visible marking or label, ~~which has, as a minimum,~~ The marking or labeling must contain**
367 **the standard radiation caution symbol ~~specified in 4.27,~~ without the conventional color requirements,**
368 **and the following wording:**

369 DANGER* – RADIOACTIVE MATERIAL

370 *or "CAUTION"

371 ~~This labeling shall be on the smallest component transported as a separate piece of equipment.~~

372 **16.13.2 The licensee may not use a container to store radioactive material ~~Each transport unless the~~**
373 **container ~~shall have permanently~~has securely attached to it a durable, legible, and clearly visible**
374 **label. ~~The label must contain which has, as a minimum,~~ the standard radiation caution symbol**
375 **specified in 4.27 and the following wording:**

376 DANGER*- RADIOACTIVE MATERIAL

377 NOTIFY CIVIL AUTHORITIES [OR NAME OF COMPANY]

378 *or "CAUTION"

379 **16.13.3 The licensee may not transport radioactive material unless the material is packaged,**
380 **labeled, marked, and accompanied with appropriate shipping papers in accordance with**
381 **the requirements of Part 17.**

382 **16.13.34** The licensee may use a uranium sinker bar in well logging applications only if it is legibly
383 impressed with the following wording:

384 CAUTION--RADIOACTIVE--DEPLETED URANIUM

385 and

386 NOTIFY CIVIL AUTHORITIES [OR COMPANY NAME] IF FOUND

387

388

Comment [jsj37]: Sections 16.12.6, and 16.12.7 replace current 16.12.6 (and subsections). Language is updated consistent with 10 CFR 39.55 to provide additional clarity in the rule.

The proposed language also corrects a unit conversion error – 1,100 MBq (megabecquerel) in the current rule should be 1,100 GBq (gigabecquerel).

The reference to Section 16.4 (well owner agreement) is added, consistent with the cross-reference in 10 CFR 39.55.

There is no equivalent language/provision in SSRCR W(1991), but is more consistent with federal rule.

NRC Compatibility = C

Comment [jsj38]: Language is updated to be consistent with 10 CFR 39.31(a)(1). The amended language specifies a more explicit prohibition on use of certain items without proper labeling.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.31(a))= D

Comment [jsj39]: This provision is incorporated into the prior paragraph.

Comment [jsj40]: Language is updated to be consistent with 10 CFR 39.31(a)(2). The amended language specifies a more explicit prohibition on use of containers without proper labeling.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.31(a))= D

Comment [jsj41]: Language is updated to be consistent with 10 CFR 39.31(a)(3). The amended language specifies a more explicit prohibition on use of containers without proper labeling. This requirement is consistent with U.S. Department of Transportation (DOT) requirements contained/referenced in Part 17 of the Colorado radiation regulations.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.31(a))= D

389 **16.14 Inspection and Maintenance.**

390 **16.14.1 Each licensee shall visually check source holders, logging tools, and source handling**
391 **tools, for defects before each use to ensure that the equipment is in good working**
392 **condition and that required labeling is present.**

393 **16.14.1.2 If defects are found, the equipment must be removed from service until**
394 **repaired, and a record must be made listing: the date of check, name of**
395 **inspector, equipment involved, defects found, and repairs made. These**
396 **records must be retained for 3 years after the defect is found.**

397 ~~16.14.12 Each licensee or registrant shall conduct, at intervals not to exceed 6 months, a program~~
398 ~~of inspection and maintenance of source holders, logging tools, source handling tools, storage~~
399 ~~containers, transport containers, and injection tools to assure proper labeling and physical~~
400 ~~condition. Each licensee shall have a program for semiannual visual inspection and routine~~
401 ~~maintenance of source holders, logging tools, injection tools, source handling tools,~~
402 ~~storage containers, transport containers, and uranium sinker bars to ensure that the~~
403 ~~required labeling is legible and that no physical damage is visible.~~

404 ~~16.14.2.1 If any inspection conducted pursuant to 16.14.1 reveals damage to labeling or~~
405 ~~components critical to radiation safety, the device shall be removed from service~~
406 ~~until repairs have been made. If defects are found, the equipment must be~~
407 ~~removed from service until repaired, and a record must be made listing:~~
408 ~~date, equipment involved, inspection and maintenance operations~~
409 ~~performed, any defects found, and any actions taken to correct the defects.~~
410 ~~These records must be retained for 3 years after the defect is found.~~

411 ~~16.14.3 Removal of a sealed source from a source holder or logging tool, and maintenance on~~
412 ~~sealed sources or holders in which sealed sources are contained may not be performed by~~
413 ~~the licensee unless a written procedure developed pursuant to 16.16 has been approved~~
414 ~~either by the Department, NRC, or an Agreement State to perform this operation.~~

415 ~~16.14.34 If a sealed source is stuck in the source holder, the licensee shall not perform any~~
416 ~~operation, such as drilling, cutting, or chiseling, on the source holder unless the licensee is~~
417 ~~specifically approved by the U.S. Nuclear Regulatory Commission NRC, or an Agreement State,~~
418 ~~or a Licensing State to perform this operation.~~

419 ~~16.14.45 The repair, opening, or modification of any sealed source shall be performed only by~~
420 ~~persons specifically authorized to do so by the Department, the U.S. Nuclear Regulatory~~
421 ~~Commission NRC, or an Agreement State, or a Licensing State.~~

422 ~~16.14.56 Records of inspection and maintenance required by 16.14.1 and 16.4.2 shall be~~
423 ~~maintained for a period of 23 years for inspection by the Department.~~

424 **REQUIREMENTS FOR PERSONNEL SAFETY**

425 **16.15 Training Requirements.**

426 ~~16.15.1 The~~ licensee or registrant ~~shall~~ **may not** permit any individual to act as a logging supervisor as
427 ~~defined in this part until such individual~~ **has:**

428 ~~16.15.1.1 Received~~ **Has completed**, in a course recognized by the Department, the ~~U.S.~~
429 ~~Nuclear Regulatory Commission NRC, or an Agreement State, or a Licensing~~
430 ~~State, instruction in the subjects outlined in Appendix 16A and demonstrated an~~
431 ~~understanding thereof;~~

Comment [jsj42]: Language in 16.14 updated for consistency with 10 CFR 39.43.

The added provision in 16.14.1 requires a pre-use inspection and is in addition to the semi-annual inspection required by 16.14.2.

The proposed language of 16.14.1, and .2 is not found in SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility = C

Comment [jsj43]: Language is modified, consistent with 10 CFR 39.43(b). The added language includes "uranium sinker bars" which is not in the current Part 16.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility = C

Comment [jsj44]: Language is added, consistent with 10 CFR 39.43(c).

The proposed language specifies that a licensee must have an approved procedure for removing a sealed source from a source holder.

There is no equivalent provision in SSR CR W.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility = C

Comment [jsj45]: The added language clarifies that records of the licensee maintenance and inspection activities specified in 16.14.1 and 16.14.2 are to be maintained. These records are in addition to any records or information generated in the event that defects are found during the inspection process.

Such records of the routine visual inspections and maintenance programs are required by federal rule, but the language is less explicit.

NRC Compatibility (10 CFR 39.43)= C

Comment [jsj46]: Language is modified consistent with 10 CFR 39.61(a)

The proposed language provides more prescriptive and/or clarifies training requirements for logging supervisors.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility = B

- 432 16.15.1.2 ~~Read and~~Has received **copies of and** instruction in:
- 433 (1) ~~The regulations contained in this part and~~ the applicable sections of Parts 1, 4,
434 ~~and 10 and 16~~ of these regulations or their equivalent;
- 435 (2) ~~conditions of appropriate~~The license or certificate of registration **under which**
436 **the logging supervisor will perform well logging;** and
- 437 (3) ~~The licensee's or registrant's operating and emergency procedures required by~~
438 **16.16, and demonstrated an understanding thereof;** and
- 439 16.15.1.3 **Has completed on-the-job training and** ~~D~~demonstrated competence ~~to use in~~
440 **the use of** sources of radiation, ~~related remote~~ handling tools, and radiation
441 survey instruments **by a field evaluation**~~which will be used on the job;~~ and
- 442 **16.15.1.4 Has demonstrated understanding of the requirements in 16.15.1.1, and**
443 **16.15.1.2 by successfully completing a written test.**
- 444
- 445
- 446 ~~16.15.2 No licensee or registrant shall~~**The licensee may not** permit any individual to **act as a logging**
447 ~~assistant~~**assist** in the handling of sources of radiation until such individual has:
- 448 **16.15.2.1 Has received instruction in the applicable sections of Parts 1, 4, 10, and 16**
449 **of these regulations or their equivalent;**
- 450 ~~16.15.2.12~~ **Has** ~~Read or~~received **copies of, and** instruction in, the licensee's or registrant's
451 operating and emergency procedures ~~in 16.16 and demonstrated an~~
452 **understanding thereof;** and
- 453 **16.15.2.23 Has demonstrated understanding of the materials listed in 16.15.2.1, and**
454 **16.15.2.2 by successfully completing a written or oral test; and**
- 455 **16.15.2.4 Has received instruction in the use** ~~Demonstrated competence to use, under~~
456 ~~the personal supervision of the logging supervisor, the~~of sources of radiation,
457 ~~related remote~~ handling tools, and radiation survey instruments, **as appropriate**
458 **for the logging assistant's intended job responsibilities** ~~which will be used~~
459 ~~on the job.~~
- 460 16.15.3 The licensee shall provide safety reviews (**refresher training**) for logging supervisors and logging
461 assistants at least once during each calendar year.
- 462 ~~16.15.4 The licensee or registrant shall maintain employee training records for inspection by the~~
463 ~~Department for 2 years following termination of the individual's employment.~~**The licensee shall**
464 **maintain a record on each logging supervisor's and logging assistant's training and**
465 **annual safety review (refresher training).**
- 466 **16.15.4.1 The training records must include copies of written tests and dates of oral**
467 **tests given after July 14, 1987.**
- 468 **16.15.4.2 The training records must be retained until 3 years following the**
469 **termination of employment.**

Comment [jsj47]: Language is modified consistent with 10 CFR 39.61(b).

The proposed language provides more prescriptive and/or clarifies training requirements for logging assistants.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.61)=B

Comment [jsj48]: The phrase "refresher training" is added here and elsewhere for clarity so it is not confused with the annual audit or inspection of logging supervisors and assistants, which is a separate requirement.

The proposed phrase "refresher training" does not appear in the federal rule or in SSR CR Part W.

Appendix D of NRC NUREG-1556, Vol. 14 similarly clarifies that the safety reviews refer to the annual refresher training.

Comment [jsj49]: Language is modified and added consistent with 39.61(d).

Similar to 16.5.3, the phrase "refresher training" is added for clarity so it is not confused with the annual audit or inspection of logging supervisors and assistants, which is a separate requirement.

The proposed phrase "refresher training" does not appear in the federal rule or in SSR CR Part W.

NRC Compatibility (39.61) = B

503 16.17.1.2 Film badges must be replaced at least monthly. Other types of personnel
504 dosimeter must be replaced at least quarterly.

505 16.17.1.3 After replacement, each personnel dosimeter must be promptly processed.

506 **16.17.2 The licensee shall provide bioassay services to individuals using licensed materials in**
507 **subsurface tracer studies if required by the license.**

508 16.17.32 Personnel monitoring records shall be maintained for inspection until the Department authorizes
509 disposition.

510 **PRECAUTIONARY PROCEDURES IN LOGGING AND SUBSURFACE TRACER OPERATIONS**

511 **16.18 Security.**

512 **16.18.1 A logging supervisor must be physically present at a temporary jobsite whenever licensed**
513 **materials are being handled or are not stored and locked in a vehicle or storage place.**
514 **The logging supervisor may leave the jobsite in order to obtain assistance if a source**
515 **becomes lodged in a well.**

516 **16.18.2** During each logging or tracer application, **except when the radiation sources are below**
517 **ground or in shipping or storage containers**, the logging supervisor or other **individual**
518 **designated employee by the logging supervisor** shall maintain direct surveillance of the
519 operation to **prevent** unauthorized or unnecessary entry into a restricted area, as
520 defined in Part 1 of these regulations.

521 **16.19 Handling Tools.**

522 The licensee shall provide and require the use of tools that will assure remote handling of sealed
523 sources other than low-activity calibration sources.

524 **16.20 Subsurface Tracer Studies and radioactive markers.**

525 16.20.1 **The licensee shall require all personnel handling radioactive tracer material to use**
526 **protective gloves, and if required by the licensee, and other appropriate protective clothing**
527 **and equipment shall be used by all personnel handling radioactive tracer material.** Precautions
528 shall be taken to avoid ingestion or inhalation of radioactive material **and to avoid**
529 **contamination of field stations and temporary jobsites.**

530 16.20.2 ~~No licensee shall cause the injection of~~ **A licensee may not knowingly inject** radioactive
531 material into ~~potable~~ **fresh water** aquifers ~~without prior written authorization from unless~~
532 **specifically authorized to do so by** the Department and any other appropriate State agency.

533 **16.20.3 The licensee may use radioactive markers in wells only if the individual markers contain**
534 **quantities of licensed material not exceeding the quantities specified in Part 3, Schedule**
535 **3B. The use of markers is subject only to the requirements of 16.10.**

536 **16.21 Particle Accelerators.**

537 No licensee or registrant shall permit aboveground testing of particle accelerators, designed for
538 use in well-logging, which results in the production of radiation, except in areas or facilities
539 controlled or shielded so that the requirements of 4.6 and 4.14 of these regulations, as applicable,
540 are met.

541 **RADIATION SURVEYS CONTAMINATION CONTROL AND SURVEY RECORDS**

Comment [jsj52]: This provision added consistent with 10 CFR Part 39.65(b).

The added language will defer to specific license requirements regarding the need for bioassay when handling unsealed materials.

General bioassay/dose monitoring requirements are also currently specified in Part 4 of the regulations, which is used in conjunction with Part 16.

NRC Compatibility = D

Comment [jsj53]: This provision added consistent with 10 CFR Part 39.71(a)

The proposed provision requires the physical presence of the logging supervisor at temporary jobsites.

NRC Compatibility = C

Comment [jsj54]: 16.20.1, and 16.20.2 are modified, consistent with 10 CFR Part 39.45.

To avoid creation of a new subsection and significant rule renumbering, the section title is expanded to include "radioactive markers", which is addressed in 16.20.3 (below).

The modified language in 16.20.1 requires that protective equipment shall be worn as specified by the licensee.

The language of 16.20.2 potentially expands the types of wells that would be covered by this provision by changing the word "potable" to "fresh" water aquifer. Fresh water aquifers may be used for both drinking and non-drinking purposes.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility = C

Comment [jsj55]: Section 16.20.3 is added consistent with 10 CFR 39.47.

The proposed language limits the types of markers that can be used in wells to those which fall within the exempt quantities specified under schedule 3B of Part 3.

There is no equivalent provision in SSRCR W.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility = D

542 **16.22 Radiation Ssurveys.**

543 ~~16.22.1 Radiation surveys or calculations shall be made and recorded for each area where radioactive~~
544 ~~materials are stored. The licensee shall make radiation surveys, including but not limited to~~
545 ~~the surveys required by 16.22.2 through 16.22.5, of each area where licensed materials are~~
546 ~~used and stored.~~

Comment [JJ56]: Language is updated consistent with 10 CFR 39.67(a).

The proposed language clarifies that surveys must be performed in areas where radioactive materials are used and not limited to storage areas only. (SSRCR W includes "storage" but was omitted from the Part 16 rule).

547 ~~16.22.2 Radiation surveys or calculations shall be made and recorded for the radiation levels in occupied~~
548 ~~positions and on the exterior of each vehicle used to transport radioactive material. Such surveys~~
549 ~~and calculations shall include each source of radiation or combination of sources to be~~
550 ~~transported in the vehicle. Before transporting licensed materials, the licensee shall make a~~
551 ~~radiation survey of the position occupied by each individual in the vehicle and of the~~
552 ~~exterior of each vehicle used to transport the licensed materials.~~

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule. NRC Compatibility = C

Comment [JJ57]: Language is updated consistent with 10 CFR 39.67(b).

553 ~~16.22.3 If the sealed source assembly is removed from the logging tool before departing the jobsite, the~~
554 ~~logging tool detector shall be energized, or a survey meter used, to assure that the logging tool is~~
555 ~~free of contamination. If the sealed source assembly is removed from the logging tool before~~
556 ~~departure from the temporary jobsite, the licensee shall confirm that the logging tool is~~
557 ~~free of contamination by energizing the logging tool detector or by using a survey meter.~~

The proposed language eliminates the option for a licensee to perform calculations in lieu of surveys. The proposed language also eliminates the requirement to survey each combination of sources. As proposed, the survey performed is expected to reflect the current configuration and quantity of sources being transported at that time.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule. NRC Compatibility = C

558 ~~16.22.4 If the licensee has reason to believe that, as a result of any operation involving a sealed~~
559 ~~source, the encapsulation of the sealed source could be damaged by the operation, the~~
560 ~~licensee shall conduct a radiation survey, including a contamination survey, during and~~
561 ~~after the operation.~~

Comment [JJ58]: Language is updated consistent with 10 CFR 39.67(c).

562 ~~16.22.45 Radiation surveys shall be made and recorded at the jobsite or wellhead for each tracer~~
563 ~~operation, except those using hydrogen-3, carbon-14, and sulfur-35. These surveys shall include~~
564 ~~measurements of radiation levels before and after the operation. The licensee shall make a~~
565 ~~radiation survey at the temporary jobsite before and after each subsurface tracer study to~~
566 ~~confirm the absence of contamination.~~

The proposed wording utilizes clearer language.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility = C

567 ~~16.22.56 Records required pursuant to 16.22.1 through 16.22.4 shall include the dates, the~~
568 ~~identification of individual(s) making the survey, the identification of survey instrument(s) used,~~
569 ~~and an exact description of the location of the survey. Records of these surveys shall be~~
570 ~~maintained for inspection by the Department for 2 years after completion of the survey. The~~
571 ~~results of surveys required pursuant to 16.22.1 through 16.22.5 must be recorded and~~
572 ~~must include:~~

Comment [JJ59]: New language is incorporated consistent with 10 CFR 39.67(d). The proposed new language provides a precautionary requirement to perform surveys in the event that damage to the source is suspected. This provision does not appear in SSRCR W.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule. NRC Compatibility = C

573 **16.22.6.1 The date(s) of the survey;**

574 **16.22.6.2 The name of the individual(s) making the survey;**

575 **16.22.6.3 The identification of the survey;**

576 **16.22.6.4 Instrument(s) used; and**

577 **16.22.6.5 The location of the survey.**

Comment [JJ60]: Language is updated consistent with 10 CFR 39.67(e). The proposed language simplifies the requirement for surveys. The temporary jobsite includes all areas where the sources will be or have been used. The proposed language does not provide an exemption for certain isotopes.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule. NRC Compatibility = C

578 **The licensee shall retain records of the surveys for inspection by the Department for 3**
579 **years after they are made.**

Comment [jsj61]: Language of 16.22.6 is updated consistent with 10 CFR 39.67(f). Plural language is incorporated for clarity as more than one individual, instrument or dates of surveys may occur.

580 **Contamination control.**

The proposed language/requirements are effectively the same as the current language.

581 **16.22.7** If the licensee detects evidence that a sealed source has ruptured or radioactive materials
582 have caused contamination, the licensee shall initiate immediately the emergency
583 procedures required by 16.16.

584 **16.22.8** If contamination results from the use of radioactive material in well logging, the licensee
585 shall decontaminate all personnel, work areas, equipment, and unrestricted areas.

586 **16.22.9** During efforts to recover a sealed source lodged in the well, the licensee shall
587 continuously monitor, with an appropriate radiation detection instrument or a logging tool
588 with a radiation detector, the circulating fluids from the well, if any, to check for
589 contamination resulting from damage to the sealed source.

590 **16.23 Documents and Records Required at Field Stations.**

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

593 16.23.1 ~~Appropriate~~The license, certificate of registration, or equivalent document(s) **authorizing the use**
594 **of sources of radiation;**

595 16.23.2 Operating and emergency procedures **required by 16.16;**

596 16.23.3 ~~Applicable~~A copy of Parts 1, 4, 10, and 16 and other applicable regulations;

597 16.23.4 Records of the latest survey instrument calibrations ~~pursuant to~~**required by** 16.8;

598 16.23.5 Records of the latest leak test results ~~pursuant to~~**required by** 16.9;

599 16.23.6 Records of ~~quarterly-physical~~ inventories **required by** ~~pursuant to~~ 16.10;

600 16.23.7 Utilization records **required by** ~~pursuant to~~ 16.11;

601 16.23.8 Records of inspection and maintenance **required by** ~~pursuant to~~ 16.14;

602 16.23.9 Survey records **required by** ~~pursuant to~~ 16.22; and

603 16.23.10 ~~Training~~ records **required by** ~~pursuant to~~ 16.15.4.

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607 **16.24 Documents and Records Required at Temporary Jobsites.**

608 Each licensee or registrant conducting operations at a temporary jobsite shall ~~have~~**maintain** the following
609 documents and records ~~available at that at the temporary jobsite for inspection by the Department until~~
610 **the well logging operation is complete:**

611 16.24.1 Operating and emergency procedures **required by 16.16;**

612 16.24.2 Survey records required pursuant to 16.22 for the period of operation at the site;

Comment [jsj62]: Language is added, consistent with 10 CFR 39.69.

The added requirements in 16.22.7 – 16.22.9 provide additional requirements specific to contamination control for subsurface tracer studies not found in the current rule.

These provisions do not appear in SSRCR W.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.69) = C

Comment [jsj63]: The requirement for decontamination of "personnel" is added, consistent with the requirement in 16.4.1.4.

Comment [jsj64]: Language is modified/added, consistent with 10 CFR 39.73.

Part 1 is included as there is reliance on this part for certain words used in Part 16, but not included in the definitions of Part 16.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.73) = C

Comment [jsj65]: Language is added, consistent with 10 CFR 39.75.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility (39.75) = C

613 16.24.3 Evidence of current calibration for the radiation survey instruments in use at the site **required by**
614 **16.8**;

615 16.24.4 When operating in the State under reciprocity, a copy of the appropriate license, certificate of
616 registration, or equivalent document(s) **authorizing use of sources of radiation**; and

617 16.24.5 Shipping papers for the transportation of radioactive material **required by Part 17**.

618 **NOTIFICATION**

619 **16.25 Notification of Incidents, Abandonment, and Lost Sources.**

620 ~~16.25.1 Notification of incidents and sources lost in other than downhole logging operations shall be made~~
621 ~~in accordance with appropriate provisions of 4.52 of these regulations. The licensee shall notify~~
622 ~~the Department of the theft or loss of radioactive materials, radiation overexposures,~~
623 ~~excessive levels and concentrations of radiation, and certain other accidents as required~~
624 ~~by 4.51, 4.52, and 4.53.~~

Comment [JJ66]: Provision modified, consistent with 10 CFR 39.77(b).

The provision adds specificity and clarity regarding notification of the department in the event of loss or theft of radioactive materials and under other circumstances.

The more specific/modified provision does not appear in SSR CR W.

The proposed language differs from SSR CR W (1991) but is more consistent with federal rule.

NRC Compatibility = D

625 16.25.2 Whenever a sealed source or device containing radioactive material is lodged downhole, the
626 licensee shall:

627 16.25.2.1 Monitor at the surface for the presence of radioactive contamination with a
628 radiation survey instrument or logging tool during logging tool recovery
629 operations; and

630 ~~16.25.2.2~~ Notify the Department immediately by telephone and subsequently within 30
631 days by confirmatory letter if the licensee knows or has reason to believe that a
632 sealed source has been ruptured. This letter shall identify the well or other
633 location, describe the magnitude and extent of the escape of radioactive material,
634 assess the consequences of the rupture, and explain efforts being planned or
635 taken to mitigate these consequences.

Comment [jsj67]: Current language is consistent with 10 CFR 39.77(a)

NRC Compatibility = C

636 ~~16.25.3~~ **If a sealed source becomes lodged in a well, and w**hen it becomes apparent that efforts to
637 recover the radioactive source will not be successful, the licensee shall:

Comment [jsj68]: Language is added, consistent with 10 CFR 39.77(c)

NRC Compatibility = C

638 **16.25.3.1 Notify the Department by telephone of the circumstances that resulted in**
639 **the inability to retrieve the source; and**

- 640 **(1) Obtain Department approval to implement abandonment procedures; or**
641 **(2) That the licensee implemented abandonment before receiving Department**
642 **approval because the licensee believed there was an immediate threat to**
643 **public health and safety; and**

Comment [jsj69]: Language is added, consistent with 10 CFR 39.77(c)(2).

NRC Compatibility = C

644 ~~16.25.3.2~~ Advise the well **owner or operator, as appropriate,** of the **abandonment**
645 **procedures under 16.4.1 or 16.4.2; regulations of the Department regarding**
646 **abandonment and an appropriate method of abandonment,** which shall include:

Comment [jsj70]: The language of subsections (1), (2), and (3) of 16.25.3.2 are retained from the current rule (and SSR CR W-1991), although they do not appear in 10 CFR 39.77 as shown here. Provisions similar to (1), (2), and (3) appear in 10 CFR 39.15(5) [found in 16.4.1.5]. Section 16.4.1.5 contains cross-references to this section (16.25.3.2).

Retaining these provisions at the point of notification requirements and the application of emergency procedures is the preferred approach.

647 **(1) The immobilization and sealing in place of the radioactive source with a cement**
648 **plug;**

649 **(2) The setting of a whipstock or other deflection device; and**

650 **(3) The mounting of a permanent identification plaque at the surface of the well,**
651 **containing the appropriate information required by 16.25.54; and**

652 **16.25.3.3** **Either ensure that abandonment procedures are implemented within 30**
653 **days after the sealed source has been classified as irretrievable or request**
654 **an extension of time if unable to complete the abandonment procedures.**

655 ~~16.25.43.3~~ ~~The licensee shall, file a written report with the Department~~ **within 30 days after a**
656 **sealed source has been classified as irretrievable, make a report in writing to the**
657 **Department of the abandonment.** The licensee shall send a copy of the report to
658 ~~the~~**each** appropriate State **or Federal** agency that issued permits or otherwise approved
659 of the drilling operation. The report shall contain the following information:

660 **16.25.4.1(+)** Date of occurrence;

661 **16.25.4.2(2)** A description of the well-logging source involved, including the radionuclide and
662 its quantity, chemical, and physical form;

663 **16.25.4.3(3)** Surface location and identification of the well;

664 **16.25.4.4(4)** Results of efforts to immobilize and seal the source in place;

665 **16.25.4.5(5)** A brief description of the attempted recovery effort;

666 **16.25.4.6(6)** Depth of the source;

667 **16.25.4.7(7)** Depth of the top of the cement plug;

668 **16.25.4.8(8)** Depth of the well;

669 **16.25.4.9(9)** The immediate threat to public health and safety justification for implementing
670 abandonment if prior Department approval was not obtained in accordance with
671 16.25.3.1(2)2(+);

672 **16.25.4.10(10)** Any other information, such as a warning statement, contained on the permanent
673 identification plaque; and

674 **16.25.4.11(11)** ~~The names of~~ State **and Federal** Agencies receiving a copy of this report.

675 **16.25.45** Whenever a sealed source containing radioactive material is abandoned downhole, the
676 licensee shall provide a means to prevent inadvertent intrusion on the source, unless the
677 source is not accessible to any subsequent drilling operations, and shall provide a
678 permanent plaque¹ for posting the well or well-bore. This plaque shall:

679 ¹ An example of a suggested plaque is shown in Appendix 16B.

680 **16.25.45.1** Be constructed of long-lasting material, such as stainless steel, brass, bronze, or
681 monel;

682 **16.25.45.2** Be mounted at the surface of the well, unless the mounting of the plaque is not
683 practical;

684 **16.25.45.3** Be at least 17 cm (7 inches) square and 3 mm (1/8th inch) thick; and

685 **16.25.45.4** Contain the following information engraved on its face:

686 (1) The word "CAUTION";

Comment [JJ71]: Language is added, consistent with 10 CFR 39.77(c)(3).

The provision requires that abandonment procedures be initiated within 30 days or for the licensee to request an extension as applicable.

The provision does not appear in SSRCR W.

The proposed language differs from SSRCR W (1991) but is more consistent with federal rule.

NRC Compatibility = C

Comment [js72]: Language is modified/added, consistent with 10 CFR 39.77(d)

NRC Compatibility = C

- 687 (2) The radiation symbol prescribed in 4.27 without the conventional color
688 requirement;
- 689 (3) The date of abandonment;
- 690 (4) The name of the well-operator or well-owner;
- 691 (5) The well name and well identification number(s) or other designation;
- 692 (6) The sealed source(s) by radionuclide and activity;
- 693 (7) The source depth and the depth to the top of the plug; and
- 694 (8) An appropriate warning, depending on the specific circumstances of each
695 abandonment.²

696 ² Appropriate warnings may include: (a) "Do not drill below plug-back depth"; (b) "Do not enlarge casing"; or (c) "Do not re-enter the
697 hole", followed by the words, "before contacting the Colorado Department of Public Health and Environment, Hazardous Materials
698 And Waste Management Division."

699 | 16.25.56 The licensee shall immediately notify the Department by telephone and subsequently by
700 confirming letter if the licensee knows or has reason to believe that radioactive material
701 has been lost in or to an underground potable aquifer. Such notice shall designate the
702 well location and shall describe the magnitude and extent of loss of radioactive material,
703 assess the consequences of such loss, and explain efforts planned or being taken to
704 mitigate these consequences.
705 |

- 706 **PART 16, APPENDIX 16A:**
- 707 **SUBJECTS TO BE INCLUDED IN TRAINING COURSES FOR LOGGING SUPERVISORS**
- 708 16A.1 Fundamentals of ~~R~~radiation ~~S~~safety **including:**
- 709 16A.1.1 Characteristics of radiation
- 710 16A.1.2 Units of radiation dose and quantity of radioactivity
- 711 16A.1.3 ~~Significance of radiation dose~~**Hazards of exposure to radiation**
- 712 (1) Radiation protection standards
- 713 (2) Biological effects of radiation dose
- 714 16A.1.4 Levels of radiation from sources of radiation
- 715 16A.1.5 Methods of **controlling and** minimizing radiation dose
- 716 (1) Working time
- 717 (2) Working distances
- 718 (3) Shielding
- 719 16A.1.6 Radiation safety practices including prevention of contamination and methods of
720 decontamination
- 721
- 722
- 723 16A.2 Radiation ~~D~~detection ~~I~~instrumentation ~~T~~to ~~B~~be ~~U~~used
- 724 16A.2.1 Use of radiation survey instruments **to include:**
- 725 (1) Operation
- 726 (2) Calibration
- 727 (3) Limitations
- 728 16A.2.2 Survey techniques
- 729 16A.2.3 Use of personnel monitoring equipment
- 730 16A.3 Equipment ~~T~~to ~~B~~be ~~U~~used **including:**
- 731 16A.3.1 ~~Handling equipment~~**Operation of equipment, including source handling equipment**
732 **and remote handling tools**
- 733 16A.3.2 Sources of radiation

Comment [jsj73]: For formatting purposes, a page break is inserted at the top of Appendix A.

Comment [jsj74]: Appendix 16A is amended for consistency with 10 CFR Part 39.61(e).

The proposed changes primarily involve minor wording changes and formatting.

NRC Compatibility = B

-
- 734 16A.3.3 Storage, ~~and control,~~ **and disposal** of ~~equipment~~ **sources of radiation**
 - 735 16A.3.4 ~~Operation and control~~ **Maintenance** of equipment
 - 736 16A.4 The Requirements of ~~P~~ **p**ertinent Federal and State Regulations
 - 737 16A.5 The Licensee's or Registrant's ~~W~~ **w**ritten ~~O~~ **o**perating and ~~E~~ **e**mergency ~~P~~ **p**rocedures
 - 738 16A.6 The Licensee's or Registrant's ~~R~~ **r**ecord ~~K~~ **k**eeping ~~P~~ **p**rocedures
 - 739 **16A.7 Case histories of accidents in well logging**
 - 740
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754 **PART 16, APPENDIX 16B:**

Comment [jsj75]: For formatting purposes, a page break is inserted at the top of Appendix B.

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

[COMPANY NAME]
[WELL IDENTIFICATION]



ONE 2 CURIE CS-137 RADIOACTIVE SOURCE
ABANDONED 3-3-75 AT 8400 FT. PLUG BACK DEPTH 8200 FT.
DO NOT RE-ENTER THIS WELL BEFORE CONTACTING
COLORADO DEPARTMENT OF PUBLIC HEALTH AND ENVIRONMENT

757

758 The size of the plaque should be convenient for use on active or inactive wells, for example, a 7-inch
759 square. Letter size of the word "CAUTION" should be approximately twice the letter size of the rest of the
760 information, for example, 1/2-inch and 1/4-inch letter size, respectively.

761

762 **EDITOR'S NOTES**

763 6 CCR 1007-1 has been divided into separate parts for ease of use. Versions prior to 04/01/2007 are
764 located in the first section, 6 CCR 1007-1. Prior versions can be accessed from the All Versions list on the
765 rule's current version page. To view versions effective on or after 04/01/2007, select the desired part of
766 the rule, for example 6 CCR 1007-1 Part 01 or 6 CCR 1007-1 Part 10.

767 **History**