

From: Robert Quillin <rquillin@smtpgate.dphe.state.co.us>
To: WND1.WNP9(sns)
Date: 10/10/96 11:24am
Subject: MESSAGE FOR MICHELLE SIME-MOORE -Reply

I passed your message to Michelle and to Chuck Mattson who is handling the drafting and Board of Health presentation.

9611080221 961101
PDR STPRG ESGCO
PDR

MEMO

Date 9/17/96

TO: Chuck Hackney

FROM: Michelle Sims-Thore

For your review.

Hearing date - 11/20/96

~~PM~~ 10/3

Paul - I just opened

on 10-1-96

Colorado Department of Public Health & Environment
Radiation Control Division
4300 Cherry Creek Drive South
Denver, Colorado 80222-1530
(303) 692-3030

STATEMENT OF BASIS AND PURPOSE
FOR STATE OF COLORADO
RULES AND REGULATIONS
PERTAINING TO RADIATION CONTROL
6 CCR 1007

PART 19
LICENSING AND RADIATION SAFETY
REQUIREMENTS FOR IRRADIATORS

September 18, 1996

96OCT-2 PM 3:39

OSP

OVERVIEW

In 1968 the State of Colorado entered into an agreement with the federal government whereby the State assumed the responsibility for the regulation of certain types of radiation and radioactive materials.

The Radiation Control Act, Title 25, Article 11, Colorado Revised Statutes 1989 ("the Act") requires the state board of health to formulate, adopt, and promulgate rules and regulations pertaining to radiation control, and that "all such regulations shall be modeled after and shall be neither more or less stringent than those proposed by the Conference of Radiation Control Program Directors, Inc...under the title, Suggested State Regulations for Control of Radiation ("the SSRCR") except in the event said board concludes on the basis of detailed findings that a substantial deviation from any said suggested state regulations is warranted...."

In order to maintain its agreement with the federal government, certain parts of the State of Colorado Rules and Regulations Pertaining to Radiation Control (the Regulations) must be compatible with, identical to, or as effective as, federal regulations. The U.S. Nuclear Regulatory Commission implemented 10 CFR Part 36, LICENSES AND RADIATION SAFETY REQUIREMENTS FOR IRRADIATORS, with an effective date of July 1, 1993. In accordance with the requirements of the Agreement State Status, the State has 3 years from the effective date to implement similar regulations. The SSRCR's have not been updated to include these new requirements, so the requirements have been extracted from the NRC's 10 CFR Part 36.

BASIS AND PURPOSE

Part 19 is being added to the Regulations to specify radiation safety requirements and licensing requirements for the use of licensed radioactive materials in irradiators. Irradiators use gamma radiation to irradiate products to change their characteristics in some way. The safety requirements apply to panoramic irradiators (those in which the material being irradiated in a room that is accessible to personnel when the source is shielded) and underwater irradiators in which the source always remains shielded under water and the product is irradiated under water. This Part does not include self-contained dry-source-storage irradiator devices, medical uses of sealed sources (such as teletherapy), or nondestructive testing (such as industrial radiography).

Irradiators are currently licensed under (1) the general provisions of Part 3 of the Regulations which requires that "the applicant is qualified by reason of training and experience" and "the applicant's proposed equipment, facilities, and procedures are adequate"; (2) the general requirements of Part 4, for example, dose limits and the need for "surveys"; and (3) using guidance contained in a draft Regulatory Guide FC 403-4, "Guide for the Preparation of Applications for Licenses for the Use of Panoramic Dry Source-Storage Irradiators, Self-Contained Wet Source-Storage Irradiators, and Panoramic Wet Source-Storage Irradiators" published by the NRC in 1985. The information

included in the Regulatory Guide was limited, and many subjects were not covered or were covered in a way now considered obsolete.

The safety requirements and procedures for irradiators are understood and agreed upon and have been incorporated on a case-by-case basis in the licensing of the States irradiators. However, these requirements and procedures were not contained in a single comprehensive document. This rule consolidates, clarifies, and standardizes the requirements for the licensing and operation of current and future irradiators.

REGULATORY ANALYSIS
FOR
COLORADO RULES AND REGULATIONS
PERTAINING TO RADIATION CONTROL
6 CCR 1007

PART 19
LICENSES AND RADIATION SAFETY
REQUIREMENTS FOR IRRADIATORS

September 18, 1996

Section 25-11-104 requires the state board of health to formulate, adopt, and promulgate rules and regulations pertaining to radiation control, and that "all such regulations shall be modeled after and shall be neither more nor less stringent than those proposed by the Conference of radiation Control Program Directors, Inc. (the "CRCPD") under the title of *Suggested State Regulations for Control of Radiation*, except that, in the event said board concludes on the basis of detailed findings that a substantial deviation from said suggested state regulations is warranted..."

In order to maintain its agreement with the federal government, certain parts of the State of Colorado Rules and Regulations Pertaining to Radiation Control (the "Regulations") must be compatible with, identical to, or as effective as, equivalent parts of the federal regulations. The adoption of this Part is necessary to maintain compatibility with regards to the State of Colorado Agreement State Status.

The Department is proposing to add Part 19, Licenses and Radiation Safety Requirements for Irradiators, to the State of Colorado Rules and Regulations Pertaining to Radiation Control (the "Regulations"). The new Part 19 is intended to advance the State's Regulations to the nationally accepted standards for radiological health, to provide guidance, and to safeguard the radiation workers and the public.

This regulatory analysis provides the background information relative to this addition to the Regulations. The proposed Regulations are evaluated against existing regulatory requirements. This analysis is prepared in fulfillment of Section 24-04-103 (4.5) (a) of the State of Colorado Administrative Procedures Act.

1. A description of the classes of persons who will bear the costs and/or benefits from the proposed rule.

The persons affected by this change of the Regulations are (1) the regulated community, consisting currently of one licensee, and (2) the radiation workers and public who operate or work in the vicinity of irradiators.

2. A description of the probable quantitative and qualitative impacts of the proposed rule, economic and otherwise, upon the affected classes.

QUALITATIVE:

This new Part will update the Regulations to include nationally-accepted standards that have been adopted by other states and the U.S. Nuclear Regulatory Commission.

This new Part will make the Regulations compatible with the requirements of the U.S. Nuclear Regulatory Commission 10 CFR Part 36.

This new Part consolidates, clarifies, and standardizes the requirements for the licensing and operation of current and future irradiators.

QUANTITATIVE:

There are no identified economic impacts to either the Department or the regulated community because of these Regulations.

No actions are required by the current irradiator licensee to meet these requirements, as all of the applicable requirements in these regulations were met during the construction and licensing process.

No economic impact will occur to the Department because of these requirements since no additional licensing or compliance action will be required.

3. Probable costs to the Department and to local health departments.
Anticipated effects on state revenues.

The impact from the proposed Regulations will be neutral for the Department due to the fact that these Regulations will not have a major impact on licensees within the State. No effects on State revenues are anticipated.

Local health departments are not impacted as they do not regulate sources of ionizing radiation.

4. A comparison of the probable costs and benefits of the proposed rule and probable costs and benefits of inaction.

There is a benefit of adoption of the proposed Part 19 of the Regulations. It will enhance the efficiency of the regulatory process governing irradiators by consolidating, clarifying, and standardizing the requirements for current and future irradiators.

Inaction by the Department would cause the Regulations to be inconsistent with standards of other states and the federal government, and would result in the Department not being compatible with the U.S. Nuclear Regulatory Commission and with the requirements of the Act.

5. A determination of whether there are less costly or less intrusive means to achieve the purpose of the proposed rule.

There are no less costly or less intrusive means available to meet the compatibility requirements as stated in the Act. The inclusion of Part 19 in the Regulations will advance Colorado to the accepted standards that have been adopted by other states and the U.S. Nuclear Regulatory Commission. They represent a national consensus of requirements that are reasonable yet necessary to protect the radiation worker and the general public.

6. A description of alternative methods for achieving the purpose of the proposed rule.

The proposed Part 19 provides the necessary standards, technical guidance and procedures to carry out the intent of the Act. There are no alternative methods available to meet the requirements of the Act and provide the clear, concise and nationally-accepted criteria necessary to provide reasonable radiation protection to radiation workers and the general public.

PART 19

LICENSES AND RADIATION SAFETY REQUIREMENTS FOR IRRADIATORS

GENERAL PROVISIONS

RH 19.1 *Not required* Purpose and Scope.

✓ 19.1.1 Part 19 contains requirements for the issuance of a license authorizing the use of sealed sources containing radioactive materials in irradiators used to irradiate objects or materials using gamma radiation. Part 19 also contains requirements for operating irradiators. The requirements of this part are in addition to the requirements of Parts 3, 4, 10, 12, 13, and 17. Nothing in this part relieves the licensee from complying with other applicable Federal, State and local regulations governing the siting, zoning, land use, and building code requirements for industrial facilities.

✓ 19.1.2 The regulations in this part apply to panoramic irradiators that have either dry or wet storage of the radioactive sealed sources and to underwater irradiators in which both the source and the product being irradiated are under water. Irradiators whose dose rates exceed 5 grays (500 rads) per hour at 1 meter from the radioactive sealed sources in air or in water, as applicable for the irradiator type, are covered by this part.

19.1.3 The regulations in this part do not apply to self-contained dry-source-storage irradiators (those in which both the source and the area subject to irradiation are contained within a device and are not accessible by personnel), medical radiology or teletherapy, radiography (the irradiation of materials for nondestructive

testing purposes), gauging, or open-field (agricultural)
irradiations.

RH 19.2 *DWB* Definitions.

✓ "Annually" means either (1) at intervals not to exceed 1 year or
(2) once per year, at about the same time each year (plus or minus
1 month).

✓ "Doubly encapsulated sealed source" means a sealed source in which
the radioactive material is sealed within a capsule and that
capsule is sealed within another capsule.

✓ "Irradiator" means a facility that uses radioactive sealed sources
for the irradiation of objects or materials and in which radiation
dose rates exceeding 5 grays (500 rads) per hour exist at 1 meter
from the sealed radioactive sources in air or water, as applicable
for the irradiator type, but does not include irradiators in which
both the sealed source and the area subject to irradiation are
contained within a device and are not accessible to personnel.

✓ "Irradiator operator" means an individual who has successfully
completed the training and testing described in RH 19.18 and is
authorized by the terms of the license to operate the irradiator
without a supervisor present.

✓ "Panoramic dry-source-storage irradiator" means an irradiator in
which the irradiations occur in air in areas potentially

1 accessible to personnel and in which the sources are stored in
2 shields made of solid materials. The term includes beam-type dry-
3 source-storage irradiators in which only a narrow beam of
4 radiation is produced for performing irradiations.

5
6 ✓ "Panoramic irradiator" means an irradiator in which the
7 irradiations are done in air in areas potentially accessible to
8 personnel. The term includes beam-type irradiators.

9
10 ✓ "Panoramic wet-source-storage irradiator" means an irradiator in
11 which the irradiations occur in air in areas potentially
12 accessible to personnel and in which the sources are stored under
13 water in a storage pool.

14
15 ✓ "Pool irradiator" means any irradiator at which the sources are
16 stored or used in a pool of water including panoramic wet-source-
17 storage irradiators and underwater irradiators.

18
19 ✓ "Product conveyor system" means a system for moving the product to
20 be irradiated to, from, and within the area where irradiation
21 takes place.

22
23 ✓ "Radiation room" means a shielded room in which irradiations take
24 place. Underwater irradiators do not have radiation rooms.

25
26 *add ?* "Seismic area" means any area where the probability of a
27 horizontal acceleration in rock of more than 0.3 times the
28 acceleration of gravity is greater than 10 percent, as designated
29 by the U.S. Geological Survey.

in 250 years

✓ "Underwater irradiator" means an irradiator in which the sources always remain shielded under water and humans do not have access to the sealed sources or the space subject to irradiation without entering the pool.

Specific Licensing Requirements

Not required
RH 19.3 Application For a Specific License.

19.3.1 A person shall file an application for a specific license authorizing the use of sealed sources in an irradiator pursuant to RH 3.8 of the regulations.

Dir 2
RH 19.4 Specific Licenses for Irradiators.

19.4.1 ✓ The Department will approve an application for a specific license for the use of licensed material in an irradiator if the applicant meets the requirements contained in this section.

19.4.2 ✓ The applicant shall satisfy the general requirements specified in RH 3.9 of the regulations and the requirements contained in this part.

19.4.3 ✓ The applicant must describe the training provided to irradiator operators including:

19.4.3.1 ✓ Classroom training;

- 1 19.4.3.2 ✓ On-the-job or simulator training;
2
- 3 19.4.3.3 ✓ Safety reviews;
4
- 5 19.4.3.4 ✓ Means employed by the applicant to test each operator's
6 understanding of the Department's regulations and licensing
7 requirements and the irradiator operating and emergency
8 procedures; and
9
- 10 19.4.3.5 ✓ Minimum training and experience of personnel who may provide
11 training.
12
- 13 19.4.4 ✓ The application must include an outline of the written operating
14 and emergency procedures listed in RH 19.19 that describes the
15 radiation safety aspects of the procedures.
16
- 17 19.4.5 ✓ The application must describe the organizational structure for
18 managing the irradiator, specifically the radiation safety
19 responsibilities and authorities of the radiation safety officer
20 and those management personnel who have important radiation safety
21 responsibilities or authorities. In particular, the application
22 must specify who, within the management structure, has authority
23 to stop unsafe operations. The application must also describe the
24 training and experience required for the position of radiation
25 safety officer.
26
- 27 19.4.6 ✓ The application must include a description of the access control
28 systems required by RH 19.8, the radiation monitors required by RH
29 19.11, the method of detecting leaking sources required by RH

1 19.22 including the sensitivity of the method, and a diagram of
2 the facility that shows the locations of all required interlocks
3 and radiation monitors.
4

5 19.4.7 ✓ If the applicant intends to perform leak testing of dry-source-
6 storage sealed sources, the applicant shall establish procedures
7 for leak testing and submit a description of these procedures to
8 the Department. The description must include the:
9

10 19.4.7.1 ✓ Instruments to be used;
11

12 19.4.7.2 ✓ Methods of performing the analysis; and
13

14 19.4.7.3 ✓ Pertinent experience of the individual who analyzes the
15 samples.
16

17 19.4.8 ✓ If licensee personnel are to load or unload sources, the applicant
18 shall describe the qualifications and training of the personnel
19 and the procedures to be used. If the applicant intends to
20 contract for source loading or unloading at its facility, the
21 loading or unloading must be done by an organization specifically
22 authorized by the U. S. Nuclear Regulatory Commission or an
23 Agreement State to load or unload irradiator sources.
24

25 19.4.9 ✓ The applicant shall describe the inspection and maintenance
26 checks, including the frequency of the checks required by
27 RH 19.23.
28

29 RH 19.5 ✓ Start of Construction.

1 19.5.1 ✓ The applicant may not begin construction of a new irradiator prior
2 to the submission to the Department of both the application for a
3 license for the irradiator and the fee required by Part 12 of the
4 regulations. As used in this section, the term "construction"
5 includes the construction of any portion of the permanent
6 irradiator structure on the site but does not include: engineering
7 and design work, purchase of a site, site surveys or soil testing,
8 site preparation, site excavation, construction of warehouse or
9 auxiliary structures, and other similar tasks. Any activities
10 undertaken prior to the issuance of a license are entirely at the
11 risk of the applicant and have no bearing on the issuance of a
12 license with respect to the requirements of The Act, and rules,
13 regulations, and orders issued under The Act.

14
15 RH 19.6 *not required* Applications for Exemptions.

16
17 19.6.1 Any application for a license or for amendment of a license
18 authorizing use of a teletherapy-type unit for irradiation of
19 materials or objects may include proposed alternatives for the
20 requirements of this part. The Department will approve the
21 proposed alternatives if the applicant provides adequate rationale
22 for the proposed alternatives and demonstrates that they are
23 likely to provide an adequate level of safety for workers and the
24 public.

25 *Amend Part B*
26 *Div 2*
27 *§ 36.19 Request for written comments - missing*
28 ✓ Design and Performance Requirements for Irradiators

29 RH 19.7 *Div 2* ✓ Performance Criteria for Sealed Sources.

19.7.1 Requirements. Sealed sources installed after January 1, 1997:

? ? where
July 1, 1993 is 3 yrs?

19.7.1.1 Must have a certificate of registration issued by the U.S.
Nuclear Regulatory Commission or an Agreement State;

19.7.1.2 Must be doubly encapsulated;

19.7.1.3 Must use radioactive material that is as nondispersible as
practical and that is as insoluble as practical if the
source is used in a wet-source-storage or wet-source-change
irradiator;

19.7.1.4 Must be encapsulated in a material resistant to general
corrosion and to localized corrosion, such as 316L stainless
steel or other material with equivalent resistance if the
sources are used in irradiator pools; and

19.7.1.5 In prototype testing of the sealed source, must have been
leak tested and found leak-free after each of the tests
described in RH 19.7.1.5.1 through 19.7.1.5.6.

19.7.1.5.1 Temperature. The test source must be held at -40°C for
20 minutes, 600°C for 1 hour, and then be subjected to
a thermal shock test with a temperature drop from
600°C to 20°C within 15 seconds.

19.7.1.5.2 Pressure. The test source must be twice subjected for
at least 5 minutes to an external pressure (absolute)
of 2 million newtons per square meter.

19.7.1.5.3

✓ Impact. A 2-kilogram steel weight, 2.5 centimeters in diameter, must be dropped from a height of 1 meter onto the test source.

19.7.1.5.4

✓ Vibration. The test source must be subjected 3 times for 10 minutes each to vibrations sweeping from 25 hertz to 500 hertz with a peak amplitude of 5 times the acceleration of gravity. In addition, each test source must be vibrated for 30 minutes at each resonant frequency found.

19.7.1.5.5

✓ Puncture. A 50-gram weight and pin, 0.3-centimeter pin diameter, must be dropped from a height of 1 meter onto the test source.

19.7.1.5.6

✓ Bend. If the length of the source is more than 15 times larger than the minimum cross-sectional dimension, the test source must be subjected to a force of 2000 newtons at its center equidistant from two support cylinders, the distance between which is 10 times the minimum cross-sectional dimension of the source.

RH 19.8 *Div 2* ✓ Access Control.

19.8.1

✓ Each entrance to a radiation room at a panoramic irradiator must have a door or other physical barrier to prevent inadvertent entry of personnel if the sources are not in the shielded position. Product conveyor systems may serve as barriers as long as they

1 reliably and consistently function as a barrier. It must not be
2 possible to move the sources out of their shielded position if the
3 door or barrier is open. Opening the door or barrier while the
4 sources are exposed must cause the sources to return promptly to
5 their shielded position. The personnel entrance door or barrier
6 must have a lock that is operated by the same key used to move the
7 sources. The doors and barriers must not prevent any individual in
8 the radiation room from leaving.

9
10 19.8.2 ✓ In addition, each entrance to a radiation room at a panoramic
11 irradiator must have an independent backup access control to
12 detect personnel entry while the sources are exposed. Detection of
13 entry while the sources are exposed must cause the sources to
14 return to their fully shielded position and must also activate a
15 visible and audible alarm to make the individual entering the room
16 aware of the hazard. The alarm must also alert at least one other
17 individual who is onsite of the entry. That individual shall be
18 trained on how to respond to the alarm and be prepared to promptly
19 render or summon assistance.

20
21 19.8.3 ✓ A radiation monitor must be provided to detect the presence of
22 high radiation levels in the radiation room of a panoramic
23 § 36.23(c) irradiator before personnel entry. The monitor must be integrated
24 with personnel access door locks to prevent room access when
25 radiation levels are high. Attempted personnel entry while the
26 monitor measures high radiation levels, must activate the alarm
27 described in RH 19.8.2. The monitor may be located in the entrance
28 (normally referred to as the maze) but not in the direct radiation
29 beam.

Why
simple test?
CO has a
pool monitor.

1 19.8.4 ✓ Before the sources move from their shielded position in a
2 panoramic irradiator, the source control must automatically
3 activate conspicuous visible and audible alarms to alert people in
4 the radiation room that the sources will be moved from their
5 shielded position. The alarms must give individuals enough time to
6 leave the room before the sources leave the shielded position.

7
8 19.8.5 ✓ Each radiation room at a panoramic irradiator must have a clearly
9 visible and readily accessible control that would allow an
10 individual in the room to make the sources return to their fully
11 shielded position.

12
13 19.8.6 ✓ Each radiation room of a panoramic irradiator must contain a
14 control that prevents the sources from moving from the shielded
15 position unless the control has been activated and the door or
16 barrier to the radiation room has been closed within a preset time
17 after activation of the control.

18
19 19.8.7 ✓ Each entrance to the radiation room of a panoramic irradiator and
20 each entrance to the area within the personnel access barrier of
21 an underwater irradiator must have a sign bearing the radiation
22 symbol and the words, "Caution (or danger) radioactive material".

23 Panoramic irradiators must also have a sign stating "High
24 radiation area", but the sign may be removed, covered, or
25 otherwise made inoperative when the sources are fully shielded.

26
27 19.8.8 ✓ If the radiation room of a panoramic irradiator has roof plugs or
28 other movable shielding, it must not be possible to operate the
29 irradiator unless the shielding is in its proper location. This

1 requirement may be met by interlocks that prevent operation if
2 shielding is not placed properly or by an operating procedure
3 requiring inspection of shielding before operating.

4
5 19.8.9 ✓ Underwater irradiators must have a personnel access barrier around
6 the pool which must be locked to prevent access when the
7 irradiator is not attended. Only operators and facility management
8 may have access to keys to the personnel access barrier. There
9 must be an intrusion alarm to detect unauthorized entry when the
10 personnel access barrier is locked. Activation of the intrusion
11 alarm must alert an individual (not necessarily onsite) who is
12 prepared to respond or summon assistance.

13
14 RH 19.9 *Shielding* ✓ Shielding.

15
16 19.9.1 ✓ The radiation dose rate in areas that are normally occupied during
17 operation of a panoramic irradiator may not exceed 0.02
18 millisievert (2 millirem) per hour at any location 30 centimeters
19 or more from the wall of the room when the sources are exposed.
20 The dose rate must be averaged over an area not to exceed 100
21 square centimeters having no linear dimension greater than 20
22 centimeters. Areas where the radiation dose rate exceeds 2
23 millirem (0.02 millisieverts) per hour must be locked, roped off,
24 or posted.

25
26 19.9.2 ✓ The radiation dose at 30 centimeters over the edge of the pool of
27 a pool irradiator may not exceed 0.02 millisieverts (2 millirem)
28 per hour when the sources are in the fully shielded position.

1 19.9.3 ✓ The radiation dose rate at 1 meter from the shield of a dry-
2 source-storage panoramic irradiator when the source is shielded
3 may not exceed 0.02 millisievert (2 millirem) per hour and at 5
4 centimeters from the shield may not exceed 0.2 millisievert (20
5 millirem) per hour.

6
7 RH 19.10 *Dir* Fire Protection.
8

9 19.10.1 ✓ The radiation room at a panoramic irradiator must have heat and
10 smoke detectors. The detectors must activate an audible alarm. The
11 alarm must be capable of alerting a person who is prepared to
12 summon assistance promptly. The sources must automatically become
13 fully shielded if a fire is detected.

14
15 19.10.2 ✓ The radiation room at a panoramic irradiator must be equipped with
16 a fire extinguishing system capable of extinguishing a fire
17 without the entry of personnel into the room. The system for the
18 radiation room must have a shut-off valve to control flooding into
19 unrestricted areas.

20
21 RH 19.11 *Dir* Radiation Monitors.
22

23 19.11.1 ✓ Irradiators with automatic product conveyor systems must have a
24 radiation monitor with an audible alarm located to detect loose
25 radioactive sources that are carried toward the product exit. If
26 the monitor detects a source, an alarm must sound and product
27 conveyors must stop automatically. The alarm must be capable of
28 alerting an individual in the facility who is prepared to summon
29 assistance. Underwater irradiators in which the product moves

1 within an enclosed stationary tube are exempt from the
2 requirements of this paragraph.

3
4 19.11.2 ✓ Underwater irradiators that are not in a shielded radiation room
5 must have a radiation monitor over the pool to detect abnormal
6 radiation levels. The monitor must have an audible alarm and a
7 visible indicator at entrances to the personnel access barrier
8 around the pool. The audible alarm may have a manual shut-off. The
9 alarm must be capable of alerting an individual who is prepared to
10 respond promptly.

11 *Div 2*
12 RH 19.12 Control of Source Movement.

13
14 19.12.1 ✓ The mechanism that moves the sources of a panoramic irradiator
15 must require a key to actuate. Actuation of the mechanism must
16 cause an audible signal to indicate that the sources are leaving
17 the shielded position. Only one key may be used at any time, and
18 only one operator or facility management may possess it. The key
19 must be attached to a portable radiation survey meter by a chain
20 or cable. The lock for source control must be designed so that the
21 key may not be removed if the sources are in an unshielded
22 position. The door to the radiation room must require the same
23 key.

24
25 19.12.2 ✓ The console of a panoramic irradiator must have a source position
26 indicator that indicates when the sources are in the fully
27 shielded position, when they are in transit, and when the sources
28 are exposed.

1 19.12.3 ✓ The control console of a panoramic irradiator must have a control
2 that promptly returns the sources to the shielded position.

3
4 19.12.4 ✓ Each control for a panoramic irradiator must be clearly marked as
5 to its function.

6
7 RH 19.13 *DWR* Irradiator Pools. ?

8
9 19.13.1 ✓ For licenses initially issued after January 1, 1997, irradiator
10 pools must either:

11
12 19.13.1.1 ✓ Have a water-tight stainless steel liner or a liner
13 metallurgically compatible with other components in the
14 pool; or

15
16 19.13.1.2 ✓ Be constructed so that there is a low likelihood of
17 substantial leakage and have a surface designed to
18 facilitate decontamination. In either case, the licensee
19 shall have a method to safely store the sources during
20 repairs of the pool. ?

21
22 19.13.2 ✓ For licenses initially issued after January 1, 1997, irradiator
23 pools must have no outlets more than 0.5 meter below the normal
24 low water level that could allow water to drain out of the pool.
25 Pipes that have intakes more than 0.5 meter below the normal low
26 water level and that could act as siphons must have siphon
27 breakers to prevent the siphoning of pool water. *July 1, 1993*

28
29 19.13.3 ✓ A means must be provided to replenish water losses from the pool.

1 19.13.4 ✓ A visible indicator must be provided in a clearly visible location
2 to indicate if the pool water level is below the normal low water
3 level or above the normal high water level.
4

5 19.13.5 ✓ Irradiator pools must be equipped with a purification system
6 designed to be capable of maintaining the water during normal
7 operation at a conductivity of 20 microsiemens per centimeter or
8 less and with a clarity so that the sources can be seen clearly.
9

10 19.13.6 ✓ A physical barrier, such as a railing or cover, must be used
11 around or over irradiator pools during normal operation to prevent
12 personnel from accidentally falling into the pool. The barrier may
13 be removed during maintenance, inspection, and service operations.
14

15 19.13.7 ✓ If long-handled tools or poles are used in irradiator pools, the
16 radiation dose rate on the handling areas of the tools may not
17 exceed 0.02 millisievert (2 millirems) per hour.
18

19 RH 19.14 *Div 2* ✓ Source Rack Protection.
20

21 19.14.1 ✓ If the product to be irradiated moves on a product conveyor
22 system, the source rack and the mechanism that moves the rack must
23 be protected by a barrier or guides to prevent products and
24 product carriers from hitting or touching the rack or mechanism.
25

26 RH 19.15 *Div 2* ✓ Power Failures.
27

28 19.15.1 ✓ If electrical power at a panoramic irradiator is lost for longer
29 than 10 seconds, the sources must automatically return to the

shielded position.

19.15.2 ✓ The lock on the door of the radiation room of a panoramic irradiator may not be deactivated by a power failure.

19.15.3 ✓ During a power failure, the area of any irradiator where sources are located may be entered only when using an operable and calibrated radiation survey meter.

RH 19.16 *Div 2* ✓ Design Requirements.

19.16.1 ✓ Irradiators whose construction begins after January 1, 1997, must meet the design requirements of this section. *July 1, 1993*

19.16.1.1 ✓ Shielding. For panoramic irradiators, the licensee shall design shielding walls to meet generally accepted building code requirements for reinforced concrete and design the walls, wall penetrations, and entranceways to meet the radiation shielding requirements of RH 19.9. If the irradiator will use more than 2×10^{17} becquerels (5 million curies) of activity, the licensee shall evaluate the effects of heating of the shielding walls by the irradiator sources.

19.16.1.2 ✓ Foundations. For panoramic irradiators, the licensee shall design the foundation, with consideration given to soil characteristics, to ensure it is adequate to support the weight of the facility shield walls.

19.16.1.3 ✓ Pool integrity. For pool irradiators, the licensee shall

1 design the pool to assure that it is leak resistant, that it
2 is strong enough to bear the weight of the pool water and
3 shipping casks, that a dropped cask would not fall on sealed
4 sources, that all outlets or pipes meet the requirements of
5 RH 19.13.2, and that metal components are metallurgically
6 compatible with other components in the pool.
7

19.16.1.4

✓ 8 Water handling system. For pool irradiators, the licensee
9 shall verify that the design of the water purification
10 system is adequate to meet the requirements of RH 19.13.5.
11 The system must be designed so that water leaking from the
12 system does not drain to unrestricted areas without being
13 monitored.
14

19.16.1.5

✓ 15 Radiation monitors. For all irradiators, the licensee shall
16 evaluate the location and sensitivity of the monitor to
17 detect sources carried by the product conveyor system as
18 required by RH 19.11.1. The licensee shall verify that the
19 product conveyor is designed to stop before a source on the
20 product conveyor would cause a radiation overexposure to any
21 person. For pool irradiators, if the licensee uses radiation
22 monitors to detect contamination under RH 19.22.2, the
23 licensee shall verify that the design of radiation
24 monitoring systems to detect pool contamination includes
25 sensitive detectors located close to where contamination is
26 likely to concentrate.
27

19.16.1.6

✓ 28 Source rack. For pool irradiators, the licensee shall verify
29 that there are no crevices on the source or between the

1 source and source holder that would promote corrosion on a
2 critical area of the source. For panoramic irradiators, the
3 licensee shall determine that source rack drops due to loss
4 of power will not damage the source rack and that source
5 rack drops due to failure of cables (or alternate means of
6 support) will not cause loss of integrity of sealed sources.
7 For panoramic irradiators, the licensee shall review the
8 design of the mechanism that moves the sources to assure
9 that the likelihood of a stuck source is low and that, if
10 the rack sticks, a means exists to free it with minimal risk
11 to personnel.
12

13 19.16.1.7

✓ Access control. For panoramic irradiators, the licensee
14 shall verify from the design and logic diagram that the
15 access control system will meet the requirements of RH 19.8.
16

17 19.16.1.8

✓ Fire protection. For panoramic irradiators, the licensee
18 shall verify that the number, location, and spacing of the
19 smoke and heat detectors are appropriate to detect fires and
20 that the detectors are protected from mechanical and
21 radiation damage. The licensee shall verify that the design
22 of the fire extinguishing system provides the necessary
23 discharge patterns, densities, and flow characteristics for
24 complete coverage of the radiation room and that the system
25 is protected from mechanical and radiation damage.
26

27 19.16.1.9

✓ Source return. For panoramic irradiators, the licensee shall
28 verify that the source rack will automatically return to the
29 fully shielded position if offsite power is lost for more

- Need to reference state statute
Need to provide certified copies
Not readily available*
- 1 than 10 seconds.
- 2
- 3 19.16.1.10 ? Seismic. For panoramic irradiators to be built in seismic
- 4 areas, the licensee shall design the reinforced concrete
- 5 radiation shields to retain their integrity in the event of
- 6 an earthquake by designing to the seismic requirements of an
- 7 appropriate ^{current} sources such as national standards or local
- 8 building codes. *Important wording omitted*
- 9
- 10 19.16.1.11 ✓ Wiring. For panoramic irradiators, the licensee shall verify
- 11 that electrical wiring and electrical equipment in the
- 12 radiation room are selected to minimize failures due to
- 13 prolonged exposure to radiation.
- 14
- 15 RH 19.17 *Dist. 2* ✓ Construction Monitoring and Acceptance Testing.
- 16
- 17 19.17.1 ✓ The requirements of this section must be met for irradiators whose
- 18 construction begins after January 1, 1997. *July 1, 1993* The requirements must
- 19 be met prior to loading sources.
- 20
- 21 19.17.1.1 ✓ Shielding. For panoramic irradiators, the licensee shall
- 22 monitor the construction of the shielding to verify that its
- 23 construction meets design specifications and generally
- 24 accepted building code requirements for reinforced concrete.
- 25
- 26 19.17.1.2 ✓ Foundations. For panoramic irradiators, the licensee shall
- 27 monitor the construction of the foundations to verify that
- 28 their construction meets design specifications.
- 29

19.17.1.3

✓ Pool integrity. For pool irradiators, the licensee shall verify that the pool meets design specifications and shall test the integrity of the pool. The licensee shall verify that outlets and pipes meet the requirements of RH 19.13.2.

19.17.1.4

✓ Water handling system. For pool irradiators, the licensee shall verify that the water purification system, the conductivity meter, and the water level indicators operate properly.

19.17.1.5

✓ Radiation monitors. For all irradiators, the licensee shall verify the proper operation of the monitor to detect sources carried on the product conveyor system and the related alarms and interlocks required by RH 19.11.1. For pool irradiators, the licensee shall verify the proper operation of the radiation monitors and the related alarm if used to meet RH 19.22.2. For underwater irradiators, the licensee shall verify the proper operation of the over-the-pool monitor, alarms, and interlocks required by RH 19.11.2.

19.17.1.6

✓ Source rack. For panoramic irradiators, the licensee shall test the movement of the source racks for proper operation prior to source loading, and testing must include source rack lowering due to simulated loss of power. For all irradiators with product conveyor systems, the licensee shall observe and test the operation of the conveyor system to assure that the requirements in RH 19.14 are met for protection of the source rack and the mechanism that moves the rack. Testing must include tests of any limit switches

1 and interlocks used to protect the source rack and mechanism
2 that moves the rack from moving product carriers.

3
4 19.17.1.7 ✓ Access control. For panoramic irradiators, the licensee
5 shall test the completed access control system to assure
6 that it functions as designed and that all alarms, controls,
7 and interlocks work properly.

8
9 19.17.1.8 ✓ Fire protection. For panoramic irradiators, the licensee
10 shall test the ability of the heat and smoke detectors to
11 detect a fire, to activate alarms, and to cause the source
12 rack to automatically become fully shielded. The licensee
13 shall test the operability of the fire extinguishing system.

14
15 19.17.1.9 ✓ Source return. For panoramic irradiators, the licensee shall
16 demonstrate that the source racks can be returned to their
17 fully shielded positions without offsite power.

18
19 19.17.1.10 ✓ Computer systems. For panoramic irradiators that use a
20 computer system to control the access control system, the
21 licensee shall verify that the access control system will
22 operate properly if offsite power is lost and shall verify
23 that the computer has security features that prevent an
24 irradiator operator from commanding the computer to override
25 the access control system when it is required to be
26 operable.

27
28 19.17.1.11 ✓ Wiring. For panoramic irradiators, the licensee shall verify
29 that the electrical wiring and electrical equipment that

1 were installed meet the design specifications.

2
3
4 ✓ Operation of Irradiators

5
6 *Dir 2*
7 RH 19.18 ✓ Training.

8 19.18.1 ✓ Before an individual is permitted to operate an irradiator without
9 a supervisor present, the individual must be instructed in:

10
11 19.18.1.1 ✓ The fundamentals of radiation protection applied to
12 irradiators (including the differences between external
13 radiation and radioactive contamination, units of radiation
14 dose, Department dose limits, why large radiation doses must
15 be avoided, how shielding and access controls prevent large
16 doses, how an irradiator is designed to prevent
17 contamination, the proper use of survey meters and personnel
18 dosimeters, other radiation safety features of an
19 irradiator, and the basic function of the irradiator);

20
21 19.18.1.2 ✓ The requirements of Parts 4, 10 and 19 of these regulations
22 that are relevant to the irradiator;

23
24 19.18.1.3 ✓ The operation of the irradiator;

25
26 19.18.1.4 ✓ Those operating and emergency procedures listed in RH 19.19
27 that the individual is responsible for performing; and

28
29 19.18.1.5 ✓ Case histories of accidents or problems involving

1 irradiators.

2
3 19.18.2 ✓ Before an individual is permitted to operate an irradiator without
4 a supervisor present, the individual shall pass a written test on
5 the instruction received consisting primarily of questions based
6 on the licensee's operating and emergency procedures that the
7 individual is responsible for performing and other operations
8 necessary to safely operate the irradiator without supervision.

9
10 19.18.3 ✓ Before an individual is permitted to operate an irradiator without
11 a supervisor present, the individual must have received on-the-job
12 training or simulator training in the use of the irradiator as
13 described in the license application. The individual shall also
14 demonstrate the ability to perform those portions of the operating
15 procedures that he or she is to perform.

16
17 19.18.4 ✓ The licensee shall conduct safety reviews for irradiator operators
18 at least annually. The licensee shall give each operator a brief
19 written test on the information. Each safety review must include,
20 to the extent appropriate, each of the following:

21
22 19.18.4.1 ✓ Changes in operating and emergency procedures since the last
23 review, if any;

24
25 19.18.4.2 ✓ Changes in regulations and license conditions since the last
26 review, if any;

27
28 19.18.4.3 ✓ Reports on recent accidents, mistakes, or problems that have
29 occurred at irradiators, if any;

1 19.18.4.4

✓ Relevant results of inspections of operator safety
performance;

4 19.18.4.5

✓ Relevant results of the facility's inspection and
maintenance checks; and

7 19.18.4.6

✓ A drill to practice an emergency or abnormal event
procedure.

10 19.18.5

✓ The licensee shall evaluate the safety performance of each
irradiator operator at least annually to ensure that regulations,
license conditions, and operating and emergency procedures are
followed. The licensee shall discuss the results of the evaluation
with the operator and shall instruct the operator on how to
correct any mistakes or deficiencies observed.

17 19.18.6

✓ Individuals who will be permitted unescorted access to the
radiation room of the irradiator or the area around the pool of an
underwater irradiator, but who have not received the training
required for operators and the radiation safety officer, shall be
instructed and tested in any precautions they should take to avoid
radiation exposure, any procedures or parts of procedures listed
in RH 19.19 that they are expected to perform or comply with, and
their proper response to alarms required in this part. Tests may
be oral.

27 19.18.7

✓ Individuals who must be prepared to respond to alarms required by
RH 19.8.2, 19.8.9, 19.10.1, 19.11.1, 19.11.2, and 19.22.2 shall be
trained and tested on how to respond. Each individual shall be

1 retested at least once a year. Tests may be oral.

2 *Div 2*
3 RH 19.19 Operating and Emergency Procedures.

4
5 19.19.1 ✓ The licensee shall have and follow written operating procedures
6 for:

7
8 19.19.1.1 ✓ Operation of the irradiator, including entering and leaving
9 the radiation room;

10
11 19.19.1.2 ✓ Use of personnel dosimeters;

12
13 19.19.1.3 Surveying the shielding of panoramic irradiators;

14
15 19.19.1.4 ✓ Monitoring pool water for contamination while the water is
16 in the pool and before release of pool water to unrestricted
17 areas;

18
19 19.19.1.5 ✓ Leak testing of sources;

20
21 19.19.1.6 ✓ Inspection and maintenance checks required by RH 19.23;

22
23 19.19.1.7 ✓ Loading, unloading, and repositioning sources, if the
24 operations will be performed by the licensee; and

25
26 19.19.1.8 ✓ Inspection of movable shielding required by RH 19.8.8, if
27 applicable.

28
29 19.19.2 ✓ The licensee shall have and follow emergency or abnormal event

procedures, appropriate for the irradiator type, for:

19.19.2.1 ✓ Sources stuck in the unshielded position;

19.19.2.2 ✓ Personnel overexposures;

19.19.2.3 ✓ A radiation alarm from the product exit portal monitor or pool monitor;

19.19.2.4 ✓ Detection of leaking sources, pool contamination, or alarm caused by contamination of pool water;

19.19.2.5 ✓ A low or high water level indicator, an abnormal water loss, or leakage from the source storage pool;

19.19.2.6 ✓ A prolonged loss of electrical power;

19.19.2.7 ✓ A fire alarm or explosion in the radiation room;

19.19.2.8 ✓ An alarm indicating unauthorized entry into the radiation room, area around the pool, or another alarmed area;

19.19.2.9 ✓ Natural phenomena, including an earthquake, a tornado, flooding, or other phenomena as appropriate for the geographical location of the facility; and

19.19.2.10 ✓ The jamming of automatic conveyor systems.

19.19.3 ✓ The licensee may revise operating and emergency procedures without

1 Department approval only if all of the following conditions are
2 met:

3
4 19.19.3.1 ✓ The revisions do not reduce the safety of the facility,

5
6 19.19.3.2 ✓ The revisions are consistent with the outline or summary of
7 procedures submitted with the license application,

8
9 19.19.3.3 ✓ The revisions have been reviewed and approved by the
10 radiation safety officer, and

11
12 19.19.3.4 ✓ The users or operators are instructed and tested on the
13 revised procedures before they are put into use.

14
15 RH 19.20 *Div 2* ✓ Personnel Monitoring.

16
17 19.20.1 ✓ Irradiator operators shall wear either a film badge or a
18 thermoluminescent dosimeter (TLD) while operating a panoramic
19 irradiator or while in the area around the pool or an underwater
20 irradiator. The film badge or TLD processor must be accredited by
21 the National Voluntary Laboratory Accreditation Program for high
22 energy photons in the normal and accidental dose ranges (see RH
23 4.17.3). Each film badge or TLD must be assigned to and worn by
24 only one individual. Film badges must be processed at least
25 monthly, and TLD's must be processed at least quarterly.

26
27 19.20.2 ✓ Other individuals who enter the radiation room of a panoramic
28 irradiator shall wear a dosimeter, which may be a pocket
29 dosimeter. For groups of visitors, only two people who enter the

1 radiation room are required to wear dosimeters. If pocket
2 dosimeters are used to meet the requirements of this paragraph, a
3 check of their response to radiation must be done at least
4 annually. Acceptable dosimeters must read within ± 30 percent of
5 the true radiation dose.

6 *Q102*
7 RH 19.21 Radiation Surveys.

8
9 19.21.1 ✓ A radiation survey of the area outside the shielding of the
10 radiation room of a panoramic irradiator must be conducted with
11 the sources in the exposed position before the facility starts to
12 operate. A radiation survey of the area above the pool of pool
13 irradiators must be conducted after the sources are loaded but
14 before the facility starts to operate. Additional radiation
15 surveys of the shielding must be performed at intervals not to
16 exceed 3 years and before resuming operation after addition of new
17 sources or any modification to the radiation room shielding or
18 structure that might increase dose rates.

19
20 19.21.2 ✓ If the radiation levels specified in RH 19.9 are exceeded, the
21 facility must be modified to comply with the requirements in
22 RH 19.9.

23
24 19.21.3 ✓ Portable radiation survey meters must be calibrated at least
25 annually to an accuracy of ± 20 percent for the gamma energy of the
26 sources in use. The calibration must be done at two points on each
27 scale or, for digital instruments at one point per decade over the
28 range that will be used. Portable radiation survey meters must be
29 of a type that does not saturate and read zero at high radiation

dose rates.

19.21.4 ✓ Water from the irradiator pool, other potentially contaminated liquids, and sediments from pool vacuuming must be monitored for radioactive contamination before release to unrestricted areas. Radioactive concentrations must not exceed those specified in Part 4, Appendix B, Table I, "Annual Limits on Intakes (ALI's) and Derived Air Concentrations (DAC's), or Table III, "Release to sewers".

19.21.5 536.57(e) Before releasing resins for unrestricted use, they must be monitored before release in an area with a background level less than 0.5 microsievert (0.05 millirem) per hour.

Oversight, sketching computer
RH 19.22 *Dir 2* Detection of Leaking Sources. *The resins may ... (missing)*

19.22.1 ✓ Each dry-source-storage sealed source must be tested for leakage at intervals not to exceed 6 months using a leak test kit or method approved by the U.S. Nuclear Regulatory Commission or an Agreement State. In the absence of a certificate from a transferor that a test has been made within the 6 months before the transfer, the sealed source may not be used until tested. The test must be capable of detecting the presence of 200 becquerels (0.005 microcurie) of radioactive material and must be performed by a person approved by the U.S. Nuclear Regulatory Commission or an Agreement State to perform the test.

19.22.2 ✓ For pool irradiators, sources may not be put into the pool unless the licensee tests the sources for leaks or has a certificate from

1 a transferor that a leak test has been done within the 6 months
2 before the transfer. Water from the pool must be checked for
3 contamination each day the irradiator operates. ^{the} This check may be
4 done either by using a radiation monitor on a pool water
5 circulating system or by analysis of a sample of pool water. If a
6 check for contamination is done by analysis of a sample of pool
7 water, the results must be available within 24 hours. If the
8 licensee uses a radiation monitor on a pool water circulating
9 system, the detection of above normal radiation levels must
10 activate an alarm. The alarm set-point must be set as low as
11 practical, but high enough to avoid false alarms. The licensee may
12 reset the alarm set-point to a higher level if necessary to
13 operate the pool water purification system to clean up
14 contamination in the pool if specifically provided for in written
15 emergency procedures.

16
17 19.22.3 ✓ If a leaking source is detected, the licensee shall arrange to
18 remove the leaking source from service and have it decontaminated,
19 repaired, or disposed of by a U.S. Nuclear Regulatory Commission
20 or Agreement State licensee that is authorized to perform these
21 functions. The licensee shall promptly check its personnel,
22 equipment, facilities, and irradiated product for radioactive
23 contamination. No product may be shipped until the product has
24 been checked and found free of contamination. If a product has
25 been shipped that may have been inadvertently contaminated, the
26 licensee shall arrange to locate and survey that product for
27 contamination. If any personnel are found to be contaminated,
28 decontamination must be performed promptly. If contaminated
29 equipment, facilities, or products are found, the licensee shall

1 arrange to have them decontaminated or disposed of by a U.S.
2 Nuclear Regulatory Commission or Agreement State licensee that is
3 authorized to perform these functions. If a pool is contaminated,
4 the licensee shall arrange to clean the pool until the
5 contamination levels do not exceed the appropriate concentration
6 in Part 4, Appendix B, Table III. (See RH 4.52 and 4.53 of these
7 regulations for notification and reporting requirements.)
8

9 RH 19.23 *Div 2* Inspection and Maintenance.

10
11 19.23.1 ✓ The licensee shall perform inspection and maintenance checks that
12 include, as a minimum, each of the following at the frequency
13 specified in the license or license application:
14

15 19.23.1.1 ✓ Operability of each aspect of the access control system
16 required by RH 19.8.

17
18 19.23.1.2 ✓ Functioning of the source position indicator required by
19 RH 19.12.2.

20
21 19.23.1.3 ✓ Operability of the radiation monitor for radioactive
22 contamination in pool water required by RH 19.22.2, using a
23 radiation check source, if applicable.

24
25 19.23.1.4 ✓ Operability of the over-pool radiation monitor at underwater
26 irradiators as required by RH 19.11.2.

27
28 19.23.1.5 ✓ Operability of the product exit monitor required by
29 RH 19.11.1.

- 1 19.23.1.6 ✓ Operability of the emergency source return control required
2 by RH 19.12.3.
3
- 4 19.23.1.7 ✓ Leak-tightness of systems through which pool water
5 circulates (visual inspection).
6
- 7 19.23.1.8 ✓ Operability of the heat and smoke detectors and extinguisher
8 system required by RH 19.10 (but without turning
9 extinguishers on).
10
- 11 19.23.1.9 ✓ Operability of the means of pool water replenishment
12 required by RH 19.13.3.
13
- 14 19.23.1.10 ✓ Operability of the indicators of high and low pool water
15 levels required by RH 19.13.4.
16
- 17 19.23.1.11 ✓ Operability of the intrusion alarm required by RH 19.8.9, if
18 applicable.
19
- 20 19.23.1.12 ✓ Functioning and wear of the system, mechanisms and cables
21 used to raise and lower sources.
22
- 23 19.23.1.13 ✓ Condition of the barrier to prevent products from hitting
24 the sources or source mechanism as required by RH 19.14.
25
- 26 19.23.1.14 ✓ Amount of water added to the pool to determine if the pool
27 is leaking.
28
- 29 19.23.1.15 ✓ Electrical wiring on required safety systems for radiation

1 damage.

2
3 19.23.1.16 ✓ Pool water conductivity measurements and analysis as
4 required by RH 19.24.2.

5
6 19.23.2 ✓ Malfunctions and defects found during inspection and maintenance
7 checks must be repaired without undue delay.

8
9 RH 19.24 *Div 2* ✓ Pool Water Purity.

10
11 19.24.1 ✓ Pool water purification system must be run sufficiently to
12 maintain the conductivity of the pool water below 20 microsiemens
13 per centimeter under normal circumstances. If pool water
14 conductivity rises above 20 microsiemens per centimeter, the
15 licensee shall take prompt actions to lower the pool water
16 conductivity and shall take corrective actions to prevent future
17 recurrences.

18
19 19.24.2 ✓ The licensee shall measure the pool water conductivity frequently
20 enough, but no less than weekly, to assure that the conductivity
21 remains below 20 microsiemens per centimeter. Conductivity meters
22 must be calibrated at least annually.

23
24 RH 19.25 *Div 2* ✓ Attendance During Operations.

25
26 19.25.1 ✓ Both an irradiator operator and at least one individual, who is
27 trained on how to respond and prepared to promptly render or
28 summon assistance if the access control alarm sounds, shall be
29 present onsite:

1 19.25.1.1 ✓ Whenever the irradiator is operated using an automatic
2 product conveyor system; and
3

4 19.25.1.2 ✓ Whenever the product is moved into or out of the radiation
5 room when the irradiator is operated in a batch mode.
6

7 19.25.2 ✓ At a panoramic irradiator at which static irradiations (no
8 movement of the product) are occurring, a person who has received
9 the training on how to respond to alarms described in RH 19.18.7
10 must be onsite.
11

12 19.25.3 ✓ At an underwater irradiator, an irradiator operator must be
13 present at the facility whenever the product is moved into or out
14 of the pool. Individuals who move the product into or out of the
15 pool of an underwater irradiator need not be qualified as
16 irradiator operators; however, they must have received the
17 training described in RH 19.18.6 and 19.18.7. Static irradiations
18 may be performed without a person present at the facility.
19

20 RH 19.26 *Dir* ✓ Entering and Leaving the Irradiation Room.
21

22 19.26.1 ✓ Upon first entering the radiation room of a panoramic irradiator
23 after an irradiation, the irradiator operator shall use a survey
24 meter to determine that the source has returned to its fully
25 shielded position. The operator shall check the functioning of the
26 survey meter with a radiation check source prior to entry.
27

28 19.26.2 ✓ Before exiting from and locking the door to the radiation room of
29 a panoramic irradiator prior to a planned irradiation, the

1 irradiator operator shall:

2
3 19.26.2.1 ✓ Visually inspect the entire radiation room to verify that no
4 one else is in it; and

5
6 19.26.2.2 ✓ Activate a control in the radiation room that permits the
7 sources to be moved from the shielded position only if the
8 door to the radiation room is locked within a preset time
9 after setting the control.

10
11 19.26.3 ✓ During a power failure, the area around the pool of an underwater
12 irradiator may not be entered without using an operable and
13 calibrated radiation survey meter unless the over-the-pool monitor
14 required by RH 19.11.2 is operating with backup power.

15
16 RH 19.27 *Div 2* ✓ Irradiation of Explosive or Flammable Materials.

17
18 19.27.1 ✓ Irradiation of explosive material is prohibited unless the
19 licensee has received prior written authorization from the
20 Department. Authorization will not be granted unless the licensee
21 can demonstrate that detonation of the explosive would not rupture
22 the sealed sources, injure personnel, damage safety systems, or
23 cause radiation overexposures of personnel.

24
25 19.27.2 ✓ Irradiation of more than small quantities of flammable material
26 (flash point below 140°C) is prohibited in panoramic irradiators
27 unless the licensee has received prior written authorization from
28 the Department. Authorization will not be granted unless the
29 licensee can demonstrate that a fire in the radiation room could

1 be controlled without damage to the sealed sources or safety
2 systems and without radiation overexposures of personnel.
3

4 **Records**

5
6 RH 19.28 Records and Retention Periods.

7
8 19.28.1 ✓ The licensee shall maintain the following records at the
9 irradiator for the periods specified:

10
11 19.28.1.1 ✓ A copy of the license, license conditions, documents
12 incorporated into a license by reference, and amendments
13 thereto until superseded by new documents or until the
14 Department terminates the license for documents not
15 superseded.

16
17 19.28.1.2 ✓ Records of each individual's training, tests, and safety
18 reviews provided to meet the requirements of RH 19.18.1,
19 19.18.2, 19.18.3, 19.18.4, 19.18.6, and 19.18.7 until 3
20 years after the individual terminates work.

21
22 19.28.1.3 ✓ Records of the annual evaluations of the safety performance
23 of irradiator operators required by RH 19.18.5 for 3 years
24 after the evaluation.

25
26 19.28.1.4 ✓ A copy of the current operating and emergency procedures
27 required by RH 19.19 until superseded or the Department
28 terminates the license. Records of the radiation safety
29 officer's review and approval of changes in procedures as

- 1 required by RH 19.19.3.3 retained for 3 years from the date
2 of the change.
- 3
- 4 19.28.1.5 ✓ Film badge and TLD results required by RH 19.20 in
5 accordance with RH 4.46 of these regulations.
- 6
- 7 19.28.1.6 ✓ Records of radiation surveys required by RH 19.21 for 3
8 years from the date of the survey.
- 9
- 10 19.28.1.7 ✓ Records of radiation survey meter calibrations required by
11 RH 19.21.3 and pool water conductivity meter calibrations
12 required by RH 19.24.2 until 3 years from the date of
13 calibration.
- 14
- 15 19.28.1.8 ✓ Records of the results of leak tests required by RH 19.22.1
16 and the results of contamination checks required by RH
17 19.22.2 for 3 years from the date of each test.
- 18
- 19 19.28.1.9 ✓ Records of inspection and maintenance checks required by
20 RH 19.23 for 3 years.
- 21
- 22 19.28.1.10 ✓ Records of major malfunctions, significant defects,
23 operating difficulties or irregularities, and major
24 operating problems that involve required radiation safety
25 equipment for 3 years after repairs are completed.
- 26
- 27 19.28.1.11 ✓ Records of the receipt, transfer, and disposal of all
28 licensed sealed sources as required by RH 3.22 and RH 4.48
29 of these regulations.

1 19.28.1.12 Records on the design checks required by RH 19.16 and the
2 construction control checks as required by RH 19.17 until
3 the license is terminated. The records must be signed and
4 dated. The title or qualification of the person signing must
5 be included.

6 *He has to look at 536.81(m) Records related to decommissioning...*
7 RH 19.29 *omitted* Reports. *[No equivalent]*
8 *In process. Part 3 Record keeping*

9 19.29.1 In addition to the reporting requirements in other parts of the
10 regulations, the licensee shall report the following events:

11 ✓
12 19.29.1.1 Source stuck in an unshielded position.

13 ✓
14 19.29.1.2 Any fire or explosion in a radiation room.

15 ✓
16 19.29.1.3 Damage to the source racks.

17 ✓
18 19.29.1.4 Failure of the cable or drive mechanism used to move the
19 source racks.

20 ✓
21 19.29.1.5 Inoperability of the access control system.

22 ✓
23 19.29.1.6 Detection of radiation source by the product exit monitor.

24 ✓
25 19.29.1.7 Detection of radioactive contamination attributable to
26 licensed radioactive material.

27 ✓
28 19.29.1.8 Structural damage to the pool liner or walls.
29

- 1 19.29.1.9 ✓ Abnormal water loss or leakage from the source storage pool.
2
3 19.29.1.10 ✓ Pool water conductivity exceeding 100 microsiemens per
4 centimeter.
5
6 19.29.2 ✓ The report must include a telephone report within 24 hours as
7 described in RH 4.52.2, and a written report within 30 days as
8 described in RH 4.53.1.2 of these regulations.
9

Subpart F - Enforcement (discussed here)

BACKGROUND AND SIGNATURE TAB

Use this side of the sheet to precede the background material when assembling correspondence.

(USE REVERSE SIDE FOR SIGNATURE TAB)

BACKGROUND AND SIGNATURE TAB

Use this side of the sheet to precede the signature page when assembling correspondence.

(USE REVERSE SIDE FOR BACKGROUND TAB)