

Distance to Boston (miles)	Plant location zone	Class I and blended price adjustments (cents per hundred-weight)
171 to 180	18	+3.5
181 to 190	19	+2.4
191 to 200	20	+1.2
201 to 210	21	0
211 to 220	22	-1.0
221 to 230	23	-2.0
231 to 240	24	-3.0
241 to 250	25	-4.0
251 to 260	26	-5.0
261 to 270	27	-6.0
271 to 280	28	-7.0
281 to 290	29	-8.0
291 to 300	30	-9.0
301 to 310	31	-10.0
311 to 320	32	-11.0
321 to 330	33	-12.0
331 to 340	34	-13.0
341 to 350	35	-14.0
351 to 260	36	-15.0
361 to 370	37	-16.0
371 to 380	38	-17.0
381 to 390	39	-18.0
391 to 400	40	-19.0
401 and over	41 and over	(¹)

¹Class I and blended price location adjustments applicable to plants located more than 400 miles from Boston shall be obtained by extending the table at the rate of 1 cent for each additional 10 miles except that in no event shall the Class I or blended price at any zone be less than the Class II price for the month.

§ 1001.60 [Amended]

9. In § 1001.60(e), the words "applicable Class II prices" are changed to read "Class II price".

§ 1001.73. [Amended]

10. In § 1001.73(a), the words "zone 21" are deleted.

§ 1001.74 [Amended]

11. In § 1001.74(d)(1), the words "zone 21" are deleted.

§ 1001.86 [Amended]

12. In § 1001.86, the "3 cents" specified in paragraph (a) is changed to "5 cents."

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[7590-01]

NUCLEAR REGULATORY COMMISSION

[10 CFR Part 34]

LICENSES FOR RADIOGRAPHY AND RADIATION SAFETY REQUIREMENTS FOR RADIOGRAPHIC OPERATIONS

Amendments of Radiography Regulations

AGENCY: U.S. Nuclear Regulatory Commission.

ACTION: Proposed rule.

SUMMARY: The Nuclear Regulatory Commission is considering several changes in its regulations on industrial radiography. Some of the changes in

the regulations proposed in these amendments are intended to reduce the radiation overexposure rate of radiographers. Other changes are intended to formalize as regulations current licensing practices.

DATES: Comment period expires May 26, 1978.

ADDRESSES: Written comments should be submitted to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

FOR FURTHER INFORMATION CONTACT:

Dr. Stephen A. McGuire, Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, phone 301-443-6920.

SUPPLEMENTARY INFORMATION:

For some time the Nuclear Regulatory Commission has been concerned with the number of radiation overexposures among radiographers. The amendments proposed here are in part intended to reduce the frequency of these overexposures. The amendments are also intended to formalize as regulations certain practices observed by the staff in the review of license applications. There has also been an effort to simplify the wording in the sections that would be amended. The proposed changes are discussed below.

A new definition of the "personal supervision" that a radiographer must give a radiographer's assistant would be added to § 34.2 of 10 CFR Part 34. The purpose is to specify that a radiographer be physically present and watching whenever a radiographer's assistant uses radiographic exposure devices, sealed sources or related sealed source handling tools, or radiation survey instruments in radiography. The amendment would not prohibit an assistant from placing film or maintaining surveillance of high radiation areas while out of the sight of the radiographer. This amendment is consistent with current licensing practice.

It is important that the radiographer be present when a radiographer's assistant performs radiographic operations because individuals are permitted, under training programs approved by the NRC staff, to begin work as a radiographer's assistant with a minimal amount of training. Typically a few hours of instruction in the licensee's operating and emergency procedures and the use of the licensee's equipment are considered sufficient to qualify an individual to act as a radiographer's assistant. The assistant is not expected to be capable of properly operating the radiographic equipment without a radiographer present. It is important for in-

dividuals to enter into the on-the-job training portion of the training program in order to enhance the classroom training they receive in radiation safety, the licensee's operating and emergency procedures, license conditions, and Commission regulations. This new requirement is not considered excessively burdensome because typically an individual will remain an assistant for at most a few months before becoming a radiographer.

A new definition of "permanent radiographic installation" also would be added to § 34.2. The term is used in proposed § 34.29 and requires definition.

Section 34.11 would be amended to specify a quarterly frequency for the internal inspections which applicants must describe in their license applications. This a codification of licensing staff practice for the purpose of making licensing requirements known in advance of license application. A quarterly frequency for checking on radiographer safety performance, together with other knowledge of the program, should enable management to conduct an adequate audit of the radiographer's working habits without causing an unreasonable administrative burden. Records of the inspections would be required.

Section 34.22 would be amended to require that during radiographic operations using crankout type radiographic exposure devices, the sealed source be secured in its shielded position each time the source is returned to that position by locking the radiographic exposure device, the crankout device, or by other suitable means. An example of other suitable means could be turning a knob to secure the source without the use of a key. At present, securing the source is not required if the device is under the direct surveillance of a radiographer or his assistant or if the radiographic operation is conducted in a facility which is either locked to prevent entry, has an automatic source retraction device which would be activated by anyone entering the area, or has an audible or visual alarm to warn both the person entering the area and the radiographer. The proposed amendment would require securing the source in crankout devices any time the device is not in use. It is current practice, as reflected in license applications or specific license conditions, to require such securing of the source. After a radiation survey has been made, it is prudent to secure the source to keep it from leaving the shielded position.

The reason for this proposed change is that there have been overexposures in which the source was retracted to its shielded position but then inadvertently moved to an unshielded position. Securing the source would prevent this movement. There have also

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been overexposures at permanent radiographic facilities equipped with two sources in which the wrong crank was turned. This exposed the unused source instead of retracting the exposed source. Securing the sources after exposures could reduce accidents of this type with the expenditure of a small effort.

Section 34.23 would be amended to require that radiographic exposure devices be checked for obvious damage each day before use and thoroughly inspected and maintained preventively each quarter. The current regulation calls for inspections and maintenance of equipment but does not specify frequencies. Daily checks and preventive quarterly maintenance are consistent with current practice reflected in license applications and with manufacturers' recommendations.

A new § 34.29 would be added to require the permanent radiographic installations have visible and audible warning signals. The visible signal is activated by radiation whenever the source is exposed. The audible signal will warn anyone attempting to enter the installation of the hazard and will make at least one other person who is familiar with the activity aware of the attempted entry. This change would delete options now given in § 29.203(c)(2). Many licensed permanent installations already have such alarm systems. Quarterly testing of the alarm and retention of test records would also be required.

A significant proportion of the radiation overexposures in recent years have happened at permanent radiographic installations that do not have such warning signals. It is believed that this change would significantly reduce the overexposure rate at permanent radiographic installations.

Section 34.31 would be amended to require that both radiographers and radiographer's assistants demonstrate understanding of their training by receiving written and field examinations. A requirement to maintain records of this training would also be added. With respect to radiographers, these changes should have little real impact since they reflect common practices among radiography licensees. However, the changes imply a more formal training and testing of radiographer's assistants than is common; many radiographer's assistants now receive only oral testing.

Section 34.33 would also be amended to require yearly accuracy checks of pocket dosimeters to assure they are reading within 30 percent of the correct radiation exposure. It has been noted that the sensitivity of direct reading pocket dosimeters varies with age and usage. In particular, if the dosimeter is not kept charged the sensitivity changes. The rate at which the sensitivity changes suggests an annual

accuracy check to assure that the dosimeters being used are accurate within ± 30 percent. The value of ± 30 percent was chosen because this accuracy is accepted by the NRC staff as adequate for the performance of personnel monitoring devices. This accuracy and the specified test frequency are in conflict with Regulatory Guide 8.4, "Direct-Reading and Indirect-Reading Pocket Dosimeters." The NRC staff intends to revise this guide soon to remove the conflict.

Section 34.33 would also be amended to state explicitly that after an individual's pocket dosimeter has gone off-scale the individual would be prohibited from further radiographic operations until the magnitude of the exposure has been evaluated.

Section 34.41 would be amended to reflect the new § 34.29 which concerns alarms at permanent radiographic installations. In addition, locking of the high radiation area to protect against unauthorized or accidental entry would no longer be an acceptable substitute for direct surveillance at temporary radiographic sites.

Section 34.43 would be amended to state specifically that an adequate radiation survey after a radiographic exposure includes a survey of the entire circumference on the radiographic exposure device and the source guide tube if there is a guide tube. Radiation levels at the radiographic exposure device can be near normal when the source is at the far end of the guide tube. Merely surveying the device is not adequate to show that the source is in the shielded position.

Section 34.43 would also be amended to specify that a radiation survey of the restricted area boundary with the source exposed must be performed before or during each radiographic exposure unless the source target configuration for an exposure is substantially the same as that of the preceding exposure or if the exposure is made in a permanent radiographic installation. The purpose of this change is to assure that adequate surveys of the perimeters of restricted areas are made. This change would assure that the restricted area has been set at a proper distance from the source.

Acceptance of this accuracy by the NRC staff was presented in a public meeting on Performance Testing of Personnel Dosimetry, November 30 and December 1, 1976. The draft ANSI Standard N716, "Criteria for Testing Personnel Dosimetry Performance," formed the technical basis for that meeting. The accuracy needs expressed in the draft standard are based on the recommendations of the International Commission on Radiation Units and Measurements (ICRU Publication 20, "Radiation Protection Instrumentation and Its Application," page 7) and the recommendations of the International Commission on Radiological Protection (ICRP Publication 21, "General Principles of Monitoring for Radiation Protection of Workers," paragraph 101).

Appendix A of Part 34 would be amended to delete instruction in NRC regulations and in the licensee's operating and emergency procedures since this requirement is redundant with § 34.31, paragraph (a)(2). The subject of case histories of some radiography accidents has been added to the appendix. It is believed that a study of how accidents have happened in the past can help avoid making the same mistakes again. The NRC staff will issue a report containing relevant case history discussions in August 1978.

Appendix A would also be amended to include instruction in the inspection and maintenance of radiographic equipment where the radiographer is expected to perform the inspection and maintenance of that equipment.

The NRC also considered the advisability of requiring radiographers to wear personal alarm dosimeters in addition to the other dosimeters now required. The best information the Commission was able to obtain indicated that certain of these personal alarm dosimeters may be of questionable reliability. Safety could be decreased by use of these devices rather than increased. This situation would occur if radiographers were to pay less attention to their radiation surveys than at present and instead were to depend on an unreliable alarm dosimeter. This substitution would be a natural human response to a situation where the radiographer felt two equivalent devices were present to warn of high radiation levels. In such a situation, the radiographer could be expected to choose the easiest method of protection—in this case by relying on the alarm dosimeter as a substitute for using the radiation survey instrument. A similar situation could arise with audible signals built into survey meters.

Because of the problem of unreliability of personal alarm dosimeters, the NRC staff, within the next few months, will draft criteria for performance of these dosimeters, emphasizing their reliability. Commercially available alarm dosimeters will then be tested. Based on the results of these tests a recommendation on requiring the use of such alarm dosimeters will be developed.

Under the Atomic Energy Act of 1954, as amended, and section 553 of title 5 of the United States Code, notice is hereby given that adoption of the following amendments of 10 CFR Part 34 is contemplated. All interested persons who desire to submit written comments for consideration on the proposed amendments should send them to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch by May 26, 1978. Copies of the comments received on the proposed amendments may be examined or

copied at the Commission's Public Document Room, 1717 H Street, NW., Washington, D.C.

1. Paragraphs (d), (e), and (f) of § 34.2 are redesignated as paragraphs (e), (f), and (g) respectively.

New paragraphs (d) and (h) are added to read as follows:

§ 34.2 Definitions.

(d) "Personal supervision" of a radiographer's assistant by a radiographer means supervision in which the radiographer is physically present at the site where sealed sources are being used and watching the assistant when the assistant uses radiographic exposure devices, sealed sources or related source handling tools, or radiation survey instruments in radiography.

(h) "Permanent radiographic installation" means a shielded installation or structure in which radiography is regularly performed.

2. Paragraph (d) of § 34.11 is amended to read as follows:

§ 34.11 Issuance of specific licenses for use of sealed sources in radiography.

(d) The applicant will have an adequate internal inspection system to assure that Commission regulations, Commission license provisions, and the applicant's operating and emergency procedures are followed by radiographers and radiographer's assistants; the inspection system shall include the performance of internal inspections at intervals not to three months and the retention of records of such inspections for two years.

3. Section 34.22 is amended to read as follows:

§ 34.22 Locking of radiographic exposure devices, storage containers, and source changers.

(a) Each radiographic exposure device shall have a lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. The exposure device or its container shall be locked each day when its use is terminated and shall remain locked until its use is resumed. In addition, during radiographic operations using crankout type radiographic exposure devices the sealed source shall be secured in its shielded position each time the source is returned to that position by locking the exposure device or the crankout control or by other suitable means.

(b) Each sealed source storage container and source changer shall have a

lock or outer locked container designed to prevent unauthorized or accidental removal of the sealed source from its shielded position. Storage containers and source changers shall be kept locked when containing sealed sources except when under the direct surveillance of a radiographer or a radiographer's assistant.

4. Section 34.28 is amended to read as follows:

§ 34.28 Inspection and maintenance of radiographic exposure devices and storage containers.

(a) The licensee shall check for obvious defects in radiographic exposure devices, storage containers, and source changers prior to use each day the equipment is used.

(b) The licensee shall conduct a program for inspection and maintenance of radiographic exposure devices, storage containers, and source changers at intervals not to exceed three months to assure proper functioning of components important to safety. Records of these inspections and maintenance shall be kept for two years.

5. A new § 34.29 is added to read as follows:

§ 34.29 Permanent radiographic installations.

Each entrance to a permanent radiographic installation shall have visible and audible warning signals. The visible signal shall be actuated by radiation whenever the source is exposed. The audible signal shall be actuated when an attempt is made to enter the installation while the source is exposed. The audible signal shall warn an individual entering the installation of the hazard and shall make at least one other individual who is familiar with the activity aware of the entry. With respect to permanent radiographic installations, this requirement supersedes the requirements in § 20.203(c)(2). The alarm system shall be tested at intervals not to exceed three months. Records of the tests shall be kept for two years.

6. Section 34.31 is amended to read as follows:

§ 34.31 Training.

(a) The licensee shall not permit any person to act as a radiographer until such person:

(1) Has been instructed in the subjects outlined in Appendix A of this part;

(2) Has received copies of and instruction in NRC regulations contained in this part and in the applicable sections of Parts 19 and 20 of this chapter, NRC license(s) under which the radiographer will perform radiography, and the licensee's operating and emergency procedures;

(3) Has demonstrated competence to use the licensee's exposure devices, sealed sources, relating handling tools, and survey instruments; and

(4) Has demonstrated understanding of the instructions in this paragraph (a) by successful completion of a written and field examination on the subjects covered.

(b) The licensee shall not permit any person to act as a radiographer's assistant until such person:

(1) Has received copies of and instruction in the licensee's operating and emergency procedures;

(2) Has demonstrated competence to use under the personal supervision of the radiographer the radiographic exposure devices, sealed sources, related handling tools, and radiation survey instruments that he will use; and

(3) Has demonstrated understanding of the instructions in this paragraph (b) by successfully completing a written and field examination on the subjects covered.

(c) Records of the above training including copies of the tests shall be maintained for as long as the individual works for the licensee as a radiographer or a radiographer's assistant.

7. Section 34.33 is amended to read as follows:

34.33 Personnel monitoring.

(a) The licensee shall not permit any individual to act as a radiographer or a radiographer's assistant unless, at all times during radiographic operations, each such individual wears a direct reading pocket dosimeter and either a film badge or a thermoluminescent dosimeter (TLD). Pocket dosimeters shall have a range from zero to at least 200 milliroentgens and shall be recharged at the start of each shift. Each film badge and TLD shall be assigned to and worn by only one individual.

(b) Pocket dosimeters shall be read and exposures recorded daily.

(c) Pocket dosimeters shall be checked at periods not to exceed one year for correct response to radiation. Acceptable dosimeters shall read within plus or minus 30 percent of the true radiation exposure.

(d) If an individual's pocket dosimeter is discharged beyond its range, his film badge or TLD shall be immediately sent for processing. The individual shall be prohibited from performing radiographic operations until the magnitude of the exposure has been evaluated.

(e) Reports received from the film badge or TLD processor and records of daily pocket dosimeter readings shall be kept for inspection by the Commission until it authorizes their disposal.

8. Section 34.41 is amended to read as follows:

34.41 Security.

During each radiographic operation not conducted in a permanent radiographic installation, the radiographer or radiographer's assistant shall maintain direct surveillance of the operation to protect against unauthorized entry into a high radiation area, as defined in Part 20 of this chapter.

9. Section 34.43 is amended to read as follows:

34.43 Radiation surveys.

(a) At least one calibrated and operable radiation survey instrument shall be available at the location of radiographic operations whenever radiographic operations are being performed.

(b) A survey with a radiation detection instrument shall be made after each radiographic exposure to determine that the sealed source has returned to its shielded position in the radiographic exposure device. The entire circumference of the device shall be surveyed. If the radiographic exposure device has a source guide tube, the survey shall include the guide tube.

(c) When the use of a radiographic exposure device or storage container is to be terminated at the end of a work period, a survey with a radiation detection instrument shall be made of the locked radiography device or storage container to determine that the sealed source is in its shielded position. A record of the surveys required by this paragraph (c) shall be kept for two years.

(d) An area survey of the perimeter of the restricted area with a radiation detection instrument shall be made with the source exposed before or during the initial radiographic exposure on each shift and when the source-target configuration for an exposure is substantially different from that of the preceding exposure. These surveys are not required for radiography performed in a permanent radiographic installation.

10. Appendix A is amended to read as follows:

APPENDIX A**I. FUNDAMENTALS OF RADIATION SAFETY**

- A. Characteristics of gamma radiation.
- B. Units of radiation dose (mrem) and quantity of radioactivity (curie).
- C. Hazards of excessive exposure of radiation.
- D. Levels of radiation from licensed material.
- E. Methods of controlling radiation dose.
 1. Working time.
 2. Working distances.
 3. Shielding.

II. RADIATION DETECTION INSTRUMENTATION TO BE USED

- A. Use of radiation survey instruments.
 1. Operation.
 2. Calibration.

3. Limitations.
- B. Survey techniques.
- C. Use of personnel monitoring equipment.
 1. Film badges and thermoluminescent dosimeters.
 2. Pocket dosimeters.

III. RADIOGRAPHIC EQUIPMENT TO BE USED

- A. Remote handling equipment.
- B. Radiographic exposure devices.
- C. Storage containers.

IV. INSPECTION AND MAINTENANCE PERFORMED BY THE RADIOGRAPHER**V. CASE HISTORIES OF RADIOGRAPHY ACCIDENTS**

11. The second sentence of the citation of authority is amended to read as follows:

AUTHORITY: * * * For the purposes of Sec. 223 68 Stat. 958 as amended; 42 U.S.C. 2273 §§ 34.11(d), 34.25(c), 34.26, 34.27, 34.28(b), 34.29, 34.31(c), 34.33(b), 34.33(e), and 34.43(c) issued under Sec. 161o., 68 Stat. 950, as amended, 42 U.S.C. 2201(o).

(Sec. 161, Pub. L. 83-703, 69 Stat. 948; Sec. 201, Pub. L. 93-438, 88 Stat. 1242 (42 U.S.C. 2201, 5841).)

Dated at Washington, D.C. this 20th day of March 1978.

For the Nuclear Regulatory Commission.

SAMUEL J. CHILK,
Secretary of the Commission.

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[7590-01]

[10 CFR Part 34]

LICENSES FOR RADIOGRAPHY AND RADIATION SAFETY REQUIREMENTS FOR RADIOGRAPHIC OPERATIONS

Advance Notice of Proposed Rule-making on Design of Radiographic Exposure Devices

AGENCY: U.S. Nuclear Regulatory Commission.

ACTION: Advance notice of proposed rulemaking.

SUMMARY: The Nuclear Regulatory Commission is undertaking development of safety design requirements for radiographic exposure devices. When completed they will be published as proposed amendments to NRC regulations. The new requirements will be intended to reduce radiation overexposures caused by equipment failure. Interested persons are invited to submit written comments on preliminary draft requirements and to take part in a public meeting to be held April 18.

DATES: Comments should be received by May 26, 1978. A public hearing will be held April 18, 1978.

ADDRESSES: Comments or suggestions for consideration in connection

with the development of the design requirements may be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch. Copies of comments received may be examined at the Commission's Public Document Room at 1717 H Street NW., Washington, D.C. Comments also may be submitted in writing or presented orally at the Public meeting on April 18, 1978, in Room P118, Phillips Building, 7920 Norfolk Avenue, Bethesda, Md.

FOR FURTHER INFORMATION CONTACT:

Mr. Donovan A. Smith, Transportation and Product Standards Branch, Division of Engineering Standards, Office of Standards Development, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, 301-443-6910.

SUPPLEMENTARY INFORMATION: Please take notice that the NRC is undertaking the development of design requirements for radiographic exposure devices intended for use under licenses issued pursuant to 10 CFR Part 34, "Licenses for Radiography and Radiation Safety Requirements for Radiographic Operations." To aid the NRC in this undertaking, interested persons are invited to submit information, comments and suggestions with respect to such requirements. Submissions may be in writing and sent to the Secretary of the Commission or may be presented in writing or orally at an informal public meeting to be held April 18, 1978, beginning at 9:30 a.m. in Room P118 of the U.S. NRC's Phillips Building, 7920 Norfolk Avenue, Bethesda, Md.

BACKGROUND

Sealed sources of gamma emitting isotopes, principally iridium-192 and cobalt-60, are extensively used in industry to nondestructively test metallic materials for defects. For example, the integrity of welded connections between sections of a pipeline to be used for transporting oil are routinely checked radiographically at the time of construction of the pipeline. In performing radiography, the sealed radioactive source is handled as part of a radiographic exposure device. That device incorporates components that are important to radiation safety. On occasion, a component has failed to perform its intended function and that failure has contributed to unnecessary exposures to the radiographer and others in the immediate vicinity. In addition, improvements in design could reduce overexposures caused by operator error.

PROPOSED ACTION

In order to reduce the number of component failures (particularly those