



**Kansas Department of Health and Environment**

**Bureau of Environmental Health**

**Radiation Control Program**

**1000 SW Jackson, Suite 330**

**Topeka, Kansas 66612-1365**

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The following procedures are for information purposes only and are not intended to be the only means for satisfying the requirements for licensees. These procedures may have to be supplemented to address new materials or methods. When adopting one of the procedures, the applicant must ensure all appropriate aspects of its licensed program are addressed.

## I. PURPOSE OF GUIDE

The purpose of this document is to provide general guidance in preparing an application for a license authorizing the use of sealed sources in radiography. Radiography as used in this guide means "the examination of the structure of materials by nondestructive methods, utilizing radiation." The Nuclear Energy Development and Radiation Control Act of 1963 charges the Kansas State Department of Health and Environment with, among other things, responsibility for regulating the receipt, possession, and use of radioactive materials. The Department is authorized to establish by rule, regulation, or order such standards and instructions to govern the possession and use of radioactive material as it may deem necessary or desirable to protect health or to minimize danger to life or property.

In the performance of its regulatory functions, the Department has promulgated the Kansas Radiation Protection Regulations.

### APPLICABLE REGULATIONS

#### **Kansas Radiation Protection Regulations (KRPR):**

Part 1, "General."

Part 3, "Licensing of Sources of Radiation."

Part 4, "Standards for Protection Against Radiation."

Part 7, "Special Requirements for Industrial Radiographic Operations."

Part 10, "Notices, Instructions and Reports to Workers: Inspections."

The Department's Regulations may be found at: <http://www.kdheks.gov/radiation/regs.html>

General requirements for issuance of a specific license are contained in Regulation 28-35-180a of Part 3. Special requirements for a specific license for use of sealed sources in radiography are contained in Regulation 28-35-181g. An application submitted in accordance with the above mentioned regulations will be evaluated against the requirements of Part 3, Part 4, Part 7, and Part 10. Part 1 contains definitions used in the other parts.

The information contained herein is intended to provide illustrative guidance and should not be considered a substitute for the applicant's careful evaluation of the proposed use of sealed sources, or for assuring that the application correctly and adequately describes the radiation safeguards and procedures to be followed.

Information not specifically discussed herein should be included with the application if the applicant considers it to be an important part of the radiation safety program. Where an application is incomplete, it may be necessary for the Department to request additional information so as to provide reasonable assurance that the applicant has established an adequate radiation safety program. Exchanges of correspondence between the Department and applicant delay final action on the application. This may be

avoided by a thorough study of Department regulations and this guide prior to the filing of an application.

## II AS LOW AS REASONABLY ACHIEVABLE

The applicant should, in addition to complying with the requirements set forth in the Kansas Radiation Protection Regulations, make every reasonable effort to maintain radiation exposures, and radioactive material effluents to unrestricted areas, As Low As Reasonably Achievable (ALARA). Applicants should give consideration to the ALARA philosophy in the development of operating procedures and in the training of personnel using radioactive material.

Some of the items that should be considered to help maintain radiation exposures as low as reasonably achievable are discussed below. The discussion is not intended to be all inclusive, but should be used as a guide in establishing an operating philosophy for maintaining occupational radiation exposures as low as reasonably achievable.

### TIME, DISTANCE AND SHIELDING

Keep radiation exposure *as low as reasonably achievable (ALARA)* in an occupational setting. This is accomplished by the techniques of *time, distance, and shielding*.

**Time:** The shorter the time in a radiation field, the less the radiation exposure you will receive. Work quickly and efficiently. Plan your work before entering the radiation field.

**Distance:** The farther a person is from a source of radiation, the lower the radiation dose. Levels decrease by a factor of the square of the distance. Do not touch radioactive materials. Use remote handling devices, etc., to move materials to avoid physical contact.

**Shielding:** Placing a radioactive source behind a massive object or a lead shield provides a barrier that can reduce radiation exposure.

The habit of taking advantage of available shielding at temporary job sites also contributes to maintaining low occupational exposures. Again, this practice can and should be addressed during initial training, on-the-job training, and refresher training.

The **most important single item** is the routine use of survey meters to ensure that radioactive sources have been returned to the storage container after each log operation. The necessity of performing adequate surveys should be emphasized during initial classroom training, on-the-job training, and refresher training of personnel. In addition to providing for items as those listed above, the necessity of using the safety equipment that is provided should be emphasized during initial training of radiation workers.

Management can also contribute to maintaining low occupational exposures by spreading the workload among personnel so that the same person does not always receive the assignment that involves the highest exposure. Management should review personnel monitoring records to

identify those individuals who have exposures higher than the average and to try to establish and correct the cause.

III. **FILING AN APPLICATION**

The information submitted must be sufficient to allow the Department (KDHE) to determine that the proposed equipment, facilities, procedures, and controls are adequate to protect health and minimize danger to life and property. Information submitted should pertain to the specific activities for which authorization is sought and should be complete. Submission of incomplete information will result in delays because of the correspondence necessary to obtain supplemental information.

Applications should be mailed to:

**Kansas Department of Health and Environment**

**Bureau of Environmental Health**

**Radiation Control Program**

**1000 SW Jackson, Suite 330**

**Topeka, KS 66612-1365**

State licensees are required to comply with Department rules and regulations, license conditions, and the content of the submitted application, at least one copy of all information submitted to the Department shall be kept by the applicant for reference.

IV. **RADIOACTIVE MATERIALS APPLICATION FORM RH-1**

Complete the application Form RH-1 following the instructions provided with the form. Send the original to KDHE; a copy should be filed and kept by the applicant. Since the space provided on the form is limited, additional sheets should be appended as necessary. Supplemental information should be labeled to identify the applicant and reference the items for which information is being given. The following examples deal with the indicated items of the Form RH-1.

**Item 1a - Applicant:** Provide the applicant or other legal entity (corporation, etc.) by name and mailing address in Item 1(a). Individuals should be designated as the applicant only if they are acting in a private capacity and the use of radioactive material is not connected with their employment with a corporation or other legal entity.

**Example**

1. Public Engineering Company  
123 Main Street, Suite A  
Town, KS 66600

**Item 1b Locations of Use:** Specify all locations of storage or use by the street address, city, and state or other descriptive address (such as 5 miles east on Highway 10, New Town, Kansas). A Post Office Box address is not acceptable. Also, clearly specify whether a location is one at which radiography and associated operations will be conducted or whether the location is only for storage of sources and devices. If radiography will be conducted at temporary job sites, state "temporary job sites in Kansas subject to the Kansas Department of Health and Environment's regulatory authority." If radiography will be conducted in a permanent facility or field station, give the specific address of each facility. Licenses will not be issued to radiographers who have no facility in Kansas unless special conditions exist.

**Example**

2. 456 Main Street, Building #4  
Town, KS 66600

Temporary job sites throughout the state of Kansas  
**NO PO BOX NUMBERS**

Attach additional sheets if more space is needed.

**Items 2 and 3: Self Explanatory.**

**Item 4 - Individual User(s):** Name **each** person who will use radioactive material and provide their qualifications (certificates/cards). If users are not named on the license then the training records shall be retained by the licensee for review by the department. An authorized radiographer shall be present and directly supervise use at any temporary job site.

**Radiography Personnel and Required Qualifications**

A. Personnel

Persons engaged in the actual handling and use of sealed sources and equipment are defined in the regulations as "Radiographer" or "Radiographer's Assistant."

Radiographer is that individual who either performs radiography, or who is in attendance at the site of use to **personally supervise** radiographic operations. The radiographer is the individual directly responsible to

the licensee's management for assuring that radiography is performed at all times in accordance with Department regulations and the conditions of the State license.

Radiographer's assistant is any individual who manipulates radiographic exposure devices, sealed sources, related handling tools, or survey instruments while under the personal supervision of the radiographer.

It is important to understand, the duties and responsibilities of a radiographer may not be delegated to a radiographer's assistant.

“Personnel supervision” means guidance and instruction by the supervisor who is physically present at the job site and who is watching the performance of the operation in such proximity that contact can be maintained and immediate assistance given, as required.

## B. Qualifications of the Radiographer and the Radiographer's Assistant

Sealed sources used in radiography usually contain multi curie quantities of gamma emitting radioactive material and are hazardous if not used properly. Therefore, each radiographer and radiographer's assistant must meet certain minimum training and experience requirements. A thorough understanding of the hazards and proper procedures for safe handling and use of radiography sources is a fundamental requirement for any individual who is to assume the duties and responsibilities of a radiographer. Part 7 limits assignment of the duties of radiographer or radiographer's assistant to individuals who meet the requirements for those positions set forth in Regulation 28-35-181g. In order to permit each applicant a choice in the manner of which personnel may be trained to qualify as radiographer, Regulation 28-35-181g does not specify detailed contents of a training program. Regulation 28-35-289, of Part 7, referred to in Regulation 28-35-181g, itemizes those major areas in which radiographers must be instructed. Radiographers must also be instructed concerning the conditions and provisions of the license under which they will perform radiography and must demonstrate competence to use the radiographic exposure devices, sealed sources, related handling tools, and appropriate survey instruments.

Radiographers must be supplied copies of Part 4, Part 7, and Part 10, the operating and emergency procedures, and the State license under which they operate as a radiographer.

An individual who acts as a radiographer's assistant must be instructed as to the licensee's operating and emergency procedures and must demonstrate competence to use the radiographic exposure devices, sealed sources, related handling tools, and survey instruments, which they will handle, under the personal supervision of the radiographer. Each radiographer's assistant must be supplied with a copy of the operating and emergency procedures.

Note that Regulation 28-35-181g requires radiographers and radiographer's assistants to demonstrate an understanding of the instructions they have received as required by that section, and to demonstrate competence to handle the equipment they will use in their assignment.

It is the licensee's responsibility to determine that a radiographer or radiographer's assistant meets the requirements set forth in the regulation.

**Example**

John Q. Public, Radiographer Jane C. Jones, Radiographer Joe T. Smith, Radiographer Assistant See attached training and experience.
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**Item 5 - Radiation Safety Officer:** Provide the name of the Radiation Protection Officer and if requested the Assistant Radiation Safety Officer in Item #5. Provide a statement with the application outlining the named individual's duties and responsibilities.

**Radiation Protection (Safety) Officer**  
**See Appendix A for suggested duties and responsibilities.**

To be considered eligible for the RSO position (K.A.R. 28-35-282d), an individual must be a qualified radiographer, have a minimum of 2,000 hours (1 year full-time field experience) of hands-on experience as a qualified radiographer, and have formal training in establishing and maintaining a radiation protection program. This should be a course specifically designed to provide training in managing and implementing a radiation safety program; a basic radiation safety course is not acceptable. While a course particular to industrial radiography would be highly encouraged, this is not required. Acceptable training programs would be a classroom course typical of those provided through universities or commercial training facilities. **Hands-on experience** means experience in all areas considered to be directly involved in the radiography process. This includes taking radiographs, surveying device and radiation areas, transporting the radiography equipment to temporary jobsites, securing the material, posting work sites with necessary warning signs, conducting radiation area surveillance, completing and maintaining records, and other tasks. Excessive time spent in only one or two of these operations (film development or area surveillance) should not be counted toward the 2,000 hours. Experience with radiography using x-rays can be included; however, the majority of experience should be in isotope radiography.

**Example**

4. John Q. Public, RSO See attached training, list of duties and responsibilities.
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**Item 6a and 6b - Radioactive Materials:** Identify each radionuclide to be used in a given device by isotope (for example, cobalt-60, iridium-192, etc.) in 6a. Identify the manufacturer, chemical or physical form (for example sealed source), Sealed Source and Device Registry number, model number and total activity or number of sources in curies in 6b (for operational flexibility, the applicant may request more sources or devices than they actually possess).

Ensure the sealed source/exposure device/source changer combinations are compatible with one another. Designate sealed sources and source changers from more than one manufacturer if they are compatible with the particular exposure device being used. This information is available from the manufacturers.

**Note:** List the radioactive materials to be used for industrial radiography purposes as well as any radioactive materials to be used for instrument calibration purposes.

**Examples:**

5. Radioactive Material (Element and Mass Number)	6. Chemical and/or Physical Form	7. Maximum Quantity Licensee May Possess at One Time
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A. Cobalt-60	Sealed source(s): (ABC, A-145-B-132)	3 source(s). No single source to exceed 33 Curies.
B. Iridium-192	Sealed source(s): (ABC, A-145-C-133)	3 source(s). No single source to exceed 120 Curies.
C. Iridium-192	Sealed source(s): ABC, A-ZB3-01)	2 source(s). No single source to exceed 150 Curies.

**Item 7 – Purpose for Which Radioactive Material Will Be Used:** Provide the purpose for which the sources and devices will be used, for example: "Sources in exposure devices to be used for the performance of industrial radiography and in source changers."

**Example**

A. To be used as components of Smith Co. ABC 400 series exposure devices and Smith ABC 400B radiography source changers for the performance of industrial radiography.
B. To be used as components of Smith Co. ABC 400 series exposure devices and Smith ABC 400B radiography source changers for the performance of industrial radiography.
C. To be used in Smith Co. Model 123 exposure device and Smith Co. T234 source changer for the performance of industrial radiography.

**Item 8 - Training:**

**The Training Program**

Except as noted in the paragraph below, an applicant for a radiography license must have an adequate program for the training of radiographers and radiographers' assistants. Regulations 28-35-181g and 28-35-289 list the major categories of subjects which must be included in the training program. These categories must be separately identified and the scope of training in each category fully explained in the license application.

**Item 9 - Experience with Radiation:** Provide the experience of actual use of radioactive material, sources and devices used by each person who will directly supervise the use of the devices or who will have radiological safety responsibilities indicated in Item 4 above.

**Item 10 and 11- Radiation Survey Instruments and Calibrations:** Regulation 28-35-278 requires that a licensee maintain sufficient calibrated and operable survey meters to make physical radiation surveys as required by Parts 4 and 7, that the instruments have a range sufficient to measure 2 milliroentgens per hour through 1 roentgen per hour, and that the instruments be calibrated at intervals not to exceed six months and after each instrument servicing (except battery changes).

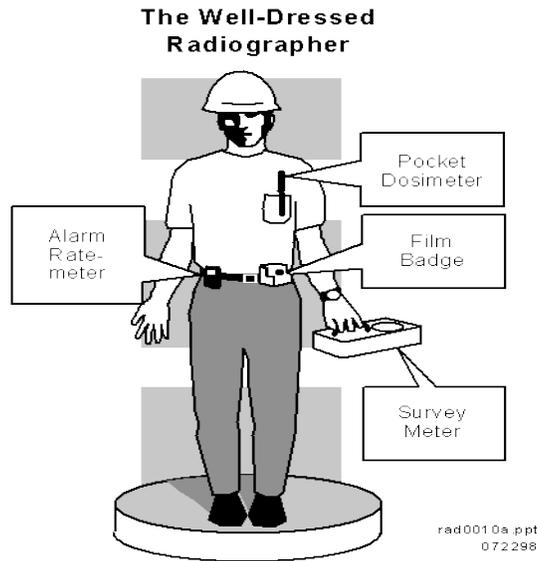
State that you will have operable and calibrated survey meters with a range from 2 milliroentgens per hour through 1 roentgen per hour. Include a statement that the meters will (1) be calibrated so that the readings are plus or minus 20% of the actual values of the range of the instrument, (2) have a calibration chart or graph showing the results of the calibration, a sticker showing the date of the last calibration, and the due date of the next calibration is affixed to the survey meter, and (3) **be calibrated at least every 6 months** or after each servicing (except battery changes). Also state that calibration records will be kept for a minimum of two years after each calibration and identify by whom the instruments will be calibrated. If calibration is performed by a person or firm outside your organization, identify each person or firm by name and/or Agreement State/NRC license number.

Regulation 28-35-284(c) states that pocket dosimeters and electronic dosimeters must be checked each 12 months for the proper response and accurate measurement of radiation. The results of this check must be such that the reading of each dosimeter is within plus or minus 30% of the true radiation exposure. Records shall be kept for two years indicating that these yearly checks have taken place.

For detailed information about survey instrument calibration, refer to ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration."

An alarming dosimeter cannot double as a survey meter.

## Item 12 - Personnel Monitoring:



### Personnel Monitoring

Regulation 28-35-284 requires that radiographers and radiographer assistants wear a direct reading pocket dosimeter, a personnel-monitoring device and an alarming rate meter at all times during radiographic operations. The pocket dosimeters with a range greater than 200 milliroentgens is acceptable only if more than one dosimeter is worn and at least one of the dosimeters has a range of 0 to 200 milliroentgens.

The only information needed in your application is a statement that the required personnel monitoring equipment, including 0 to 200 milliroentgen dosimeters, will be used by radiographic personnel. State your maximum time period for exchange of the film badges or TLDs. Personal monitoring devices shall be exchanged at least monthly. The name and address of the service provider. The service provider must be accredited by NVLAP (National Voluntary Laboratory Accreditation Program) for the device, radiation type and exposure expected to be encountered.

Regulation 28-35-284 states that no individual may act as a radiographer or radiographer's assistant unless, at all times during radiographic operations, that person wears a direct-reading pocket dosimeter, a personnel-monitoring device and an alarming dosimeter. Instruct personnel that they are required to wear direct-reading pocket dosimeters, a personnel-monitoring device and an alarming dosimeter when they are engaged in radiographic operations. Instruct personnel to charge their pocket dosimeters at the start of each workday so that the dosimeters are capable of reading full scale.

The dosimeter reading must be recorded at the beginning and end of each workday.

Include instructions about how and where dosimetry devices are to be stored when not in use. The storage place should be dry, radiation free, and cool so that the devices will not be affected by adverse environmental conditions.

## Off-Scale Pocket Dosimeter Readings

Regulation 28-35-284(d) requires that an individual's personnel-monitoring device be immediately sent for processing if the self-reading pocket dosimeter is found to be off scale. There are no exceptions to this requirement. Regardless of the circumstances, the personnel-monitoring device must be sent for processing if the pocket dosimeter is found to be off scale during or at the end of the work shift of the person who was wearing the dosimeter.

Instructions to personnel for action to be taken if a dosimeter is found to be off scale should, as a minimum, include the following:

1. Stop work immediately and place the source in the safe storage position in the exposure device.
2. Notify the individual specified in the emergency procedures.
3. The individual shall not resume any work associated with the use of sources of radiation until a determination of the amount of the individual's radiation exposure is made.

**Item 13 - Facilities and Equipment:** Regulation 28-35-180a states that an application will be approved if, among other things, the applicant's proposed equipment and facilities are adequate to protect health and minimize danger to life or property.

A permanent radiographic installation is at a fixed location; it is shielded so that the area outside the facility is an unrestricted area, and is not under continuous surveillance. The facility may be used only occasionally for performance of radiography, but it should be considered a permanent facility because it is the nature of the facility rather than the frequency of use that determines whether the facility is a permanent radiographic facility.

If you intend to perform radiography in a permanent radiography facility or facilities, provide the following information for each facility:

1. An annotated sketch or drawing of the facility and its surroundings that shows:
  - a. The scale to which the sketch or drawing is made (the same scale should be used for all sketches and drawings).
  - b. The type, thickness, and density of shielding materials on all sides, including the floor and roof.
  - c. The locations of entranceways and other points of access into the facility.
  - d. A description of the nature of the areas adjacent to the facility and the distance to these areas. Include information on areas adjacent to, above, and below the facility.

2. A description of the visible-audible signal system, its location, and how it meets the requirements in 28-35-282b. The visible signal must be activated by radiation whenever the source is exposed, and the audible signal must be activated when an attempt is made to enter the facility when the source is exposed. The requirement for the visible-audible signal system is in addition to such other measures that may be taken to prevent access into the facility as locked doors.

Regulation 28-35-220a provides an alternative to the visible-audible alarm system required by 28-35-282b. It is acceptable to use a system that will reduce the radiation level if the entrance to a high radiation area is opened while a source is out of its safe storage condition. The system must be automatic and may not depend on action by radiography personnel. If you intend to use this alternative, provide a description of your system.

3. The results of radiation level calculations or actual radiation measurements adjacent to, above, and below the facility. The radiation level in all directions around the facility, including the roof, should not exceed 2 milliroentgens in any hour. Clearly identify the type of source (isotope), the amount of radioactive material in the source, and the position of the source within the facility for the calculations or measurements.

Variations will be considered if construction requirements preclude shielding the roof to meet the 2 milliroentgen in any hour radiation level. Provide the following information to obtain approval for a variance:

- a. Means of access to the roof.
- b. Procedures for ensuring that no individual is on the roof or could gain access to the roof during the performance of radiography.
- c. A commitment that the roof will be posted with "Caution (or Danger) Radiation Area" signs.
- d. The steps taken to minimize radiation on the roof.

Radiation levels in excess of a high radiation area (100 mrem in any hour whole body exposure) require special access controls (see 28-35-219a).

4. Limitations (if needed) on positioning or sources or type (isotope) and amount of radioactive material that may be used in the facility to ensure that areas adjacent to, above, and below the facility will be uncontrolled areas during the performance of radiography.

#### **Item 14 - Radiation Protection Program:**

##### **The Internal Inspection System or Other Management Control**

An applicant for a radiography license must have an established system for maintaining active control over receipt, possession and use of radioactive material procured under the license. The system must ensure

that the license provisions, Department regulations, and operating and emergency procedures are followed by radiographers and radiographer's assistants. Subsection 28-35-181g (3) of Part 3 requires that the applicant for a radiography license include with his application a description of the internal inspection system or other management control to be followed for maintaining such active control.

The type and extent of the radiography program to be conducted will establish the frequency and scope of the system to be followed. Periodic inspections of radiographic operations should be made by a person of authority in management on both an announced and unannounced basis. Management should exercise a continued review of records or receipt and disposal of licensed material, and such records as personnel monitoring results, instrument calibrations, leak test results, quarterly inventories, utilization logs, and surveys. The Department will review adequacy of the system to be followed by the applicant against the proposed radiography program as described in the application.

Regulation 28-35-181(d) requires that each licensee or registrant conduct an internal audit to ensure that the agency's radioactive material license conditions and the licensee's or registrant's operating and emergency procedures are followed. These audits shall be performed at least quarterly, and each radiographer shall be audited at least quarterly.

### **Operating and Emergency Procedures**

**See Appendix D for suggested routine emergency procedures.**

Regulation 28-35-181g requires that operating and emergency procedures be established and submitted to the Radiation Control Program, as part of your application. In addition, if radiographers will perform other operations such as source exchange, leak-testing, and quarterly inspection and maintenance of equipment, appropriate procedures and instructions for these operations should be included in your operating and emergency procedures.

The purpose of operating and emergency procedures is to provide radiography personnel with clear and specific guidance and instruction for all operations they will perform. The topics that should be included in the operating and emergency procedures are not in any specific order of importance. A sequential set of procedures and instructions from the beginning to the end of the workday is an acceptable format. Instructions for nonroutine operations, for example, quarterly inspection and maintenance, may be included as appendices.

Regulation 28-35-283 lists the topics that need to be covered in your operating and emergency procedures.

### **Handling and Use of Sealed Sources and Radiography Exposure Devices**

Provide step-by-step instructions for using each type of radiographic device. Instructions for "crankout" devices should be separate from those for "pipelines" devices. Manufacturers' manuals and similar

documents should not be incorporated into the procedures; rather, information should be extracted from them.

**NOTE: Two-Man Rule**

When radiographic operations are performed outside a permanent radiographic installation, **at least two qualified radiographic personnel must be present to provide constant surveillance** of the operations and be capable of providing **immediate assistance** to prevent unauthorized entry to the restricted area. **At least one of the individuals must be a radiographer**; the other may be another radiographer or a trained radiographer's assistant. Operating procedures must comply with the **two-man rule** for radiographic operations at any locations other than permanent radiographic facilities.

Radiographic personnel are required to maintain continuous direct visual surveillance of operations to protect against unauthorized entry to the high-radiation area during radiographic operations. Radiographic personnel should be instructed to keep the perimeter of the restricted area under continuous surveillance to prevent unnecessary exposure of individuals. Operating procedures should specify steps for responding to unauthorized entry to the restricted area.

For example, personnel should be instructed to terminate the radiographic exposure immediately before confronting the person who entered the restricted area.

**Methods and Occasions for Conducting Radiation Surveys**

The following are examples of surveys you will need to make during radiography and associated operations:

- a. Determining the boundary of the controlled area.
- b. Determining that the source has returned to the safe storage position after each radiographic exposure.
- c. Determining the radiation levels at external surfaces of storage facilities, including vehicle used for storage.
- d. Determining the radiation levels in and around vehicles used for transporting sources devices.
- e. Determining that radiation levels around containers prepared for shipment comply with Department of Transportation regulations.
- f. Determining that radiation levels around radiographic exposure devices comply with the requirements in 28-35-275.

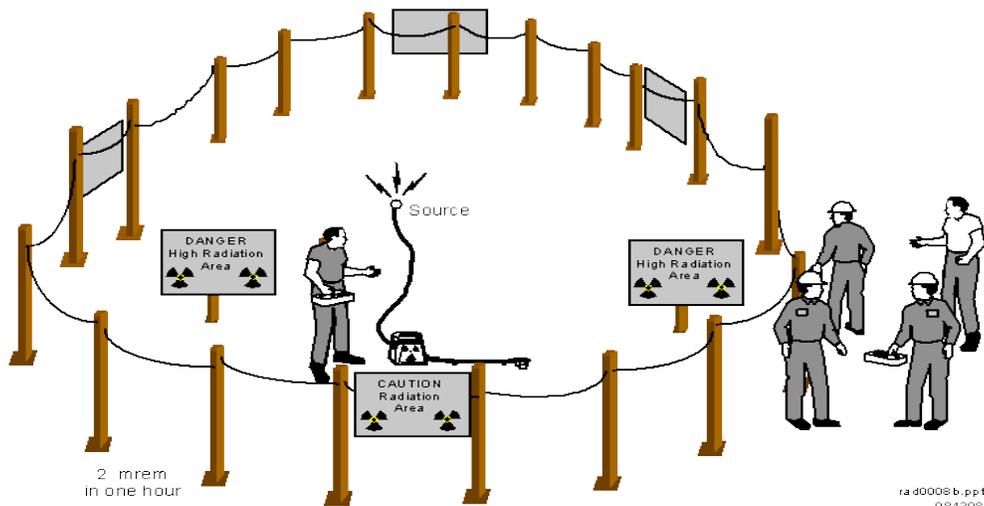
g. Determining that sources are in a safe storage position following source exchange and that radiation levels around source changers meet regulatory requirements.

These surveys will be discussed in more detail under the appropriate topics. In general, surveys need to be made whenever a source is manipulated or moved.

### Methods for Controlling Access to Radiographic Areas

Regulation 28-35-219(a) of Part 4 requires posting of radiation areas and high radiation areas, respectively.

For temporary job site radiography, it is acceptable to post the perimeter of the controlled area rather than the perimeter of the radiation area. Instruct personnel to post "Caution (or Danger) Radiation Area" signs at the calculated 2 milliroentgens in any one hour radiation level and to make a confirming survey after the source has been exposed.



The perimeter of the high radiation area must be posted with "Caution (or Danger) High Radiation Area" signs at the calculated 100 milliroentgens per hour radiation level. Do not include instructions for a confirming survey of the high radiation area perimeter, since such a survey could lead to unnecessary exposure of personnel.

For permanent radiographic installations, provide instructions to personnel about posting the entrance to the facility with "Caution (or Danger) High Radiation Area" signs and provide procedures to ensure that the visible-audible signal system is operable.

Regulation 28-35-285 requires direct surveillance to protect against unauthorized entry into a high radiation area except where the high radiation area is equipped with a control device or alarm system or where the high radiation area is locked to protect against unauthorized or accidental entry.

For radiography in nonpermanent facilities, instruct personnel to keep the perimeter of the controlled area under continuous surveillance. Specify steps to take in the event that unauthorized personnel enter the

controlled area, for example, immediate termination of the radiographic exposure. Surveillance of the perimeter of the controlled area will protect against entry into the high radiation area and prevent unnecessary exposure of individuals.

### **Methods and Occasions for Locking and Securing Radiographic Exposure Devices, Storage Containers, and Sealed Sources**

Regulation 28-35-276 requires that locked radiographic exposure devices and storage containers be physically secured to prevent tampering or removal by unauthorized personnel. Unless a radiographer or radiographer's assistant is physically present to maintain surveillance, a device containing a source should be placed in storage so that it is not accessible to unauthorized persons.

There may be situations in which radiography is performed in such a location that it would take extraordinary effort to gain access to the device, e.g., at the top of a building under construction. In anticipation of such situations, provide specific procedures for an alternative method of securing the device and the circumstances for the alternative method. Keep in mind that roping an area and posting signs do not constitute an acceptable alternative.

The storage facility should be such that the area around it is an uncontrolled area (no more than 2 milliroentgens in any hour at 12 inches (30 cm) from any surface); the facility should be posted with "Caution (or Danger) Radioactive Material" signs. A physical survey should be performed to confirm that the area around the storage facility is an uncontrolled area.

Regulation 28-35-276 requires that devices be secured in the shielded position each time the source is returned to that position. The procedures for using the devices must require locking the device at the end of each exposure. A radiation survey must be performed to confirm that the source is in the safe shielded position. For crankout devices, the survey must include the guide tube and the device itself.

## RH-3 form "Notice to Employees" must be posted.

FORM RH-3  
(06/11)



### NOTICE TO EMPLOYEES STANDARDS FOR PROTECTION AGAINST RADIATION (Part 4) NOTICES, INSTRUCTIONS AND REPORTS TO WORKER, INSPECTIONS (Part 10)

In the Kansas Radiation Protection Regulations, the Department of Health and Environment Has Established Certain Provisions for the Options of Employees Engaged in Activities under an Agency License or Registration.

#### YOUR EMPLOYER'S RESPONSIBILITY

Your employer is required to:

1. Apply these regulations to work involving sources of radiation.
2. Post or otherwise make available to you a copy of the Department of Health and Environment regulations, licenses, and operating procedures which apply to work you are engaged in, and explain their provisions to you.
3. Post any Notice of Violation involving radiological working conditions, proposed imposition of civil penalties or orders.

#### YOUR RESPONSIBILITY AS AN EMPLOYEE

You should familiarize yourself with those provisions of the Department of Health and Environment regulations, and the operating procedures which apply to the work you are engaged in. You should observe their provisions for your own protection and that of your co-workers.

#### WHAT IS COVERED BY THESE REGULATIONS

1. Annual dose limits of individuals occupationally exposed to radiation and radioactive material;
2. Measures to be taken after accidental exposure;
3. Personnel monitoring, surveys and equipment;
4. Caution signs, labels and safety interlock equipment;
5. Occupational dose records and reports;
6. Options for employees regarding Department Inspections;
7. Related matters.

#### CONTACTING THE DEPARTMENT

Inquiries dealing with the matters outlined above can be sent to Radiation Control Program, Bureau of Environmental Health, Kansas Department of Health and Environment, 1000 530' Federal, Suite 300, Topeka, Kansas, 66612-1365, call (785) 266-1560, FAX (785) 266-0984, or the internet at [www.kdheks.gov/radiation](http://www.kdheks.gov/radiation).

#### REPORTS ON YOUR EXPOSURE HISTORY

1. The Department of Health and Environment regulations require that your employer give you a written report if you receive an occupational dose in excess of any applicable limit as set forth in the regulations or in the license. The occupational dose limits for individuals are set forth in 28-35-212a, 28-35-212b, 28-35-212c, 28-35-212d and 28-35-212e of the regulations. These sections specify occupational dose limits for exposure to radiation and exposure to concentrations of radioactive material in air or water.
2. If you work where personnel monitoring is required, or if you request information on your occupational dose:
  - a. Your employer must give you a written report, upon termination of your employment, of your occupational dose, or upon request, and;
  - b. Your employer must advise you annually of your occupational dose.

#### INSPECTIONS

All licensed or registered activities are subject to inspection by representatives of the Department of Health and Environment. In addition, any employee or representative of the employee who believes that there is a violation of the Nuclear Energy Development and Radiation Control Act (46-1601) or any of the regulations issued there under, or the terms of the employer's license or registration with regard to radiological working conditions at which the employee is engaged, may request an inspection by sending a notice of the alleged violation to the Kansas Department of Health and Environment. The request must set forth the specific grounds for the notice, and must be signed by the employee or a representative of the employee. During inspections, Agency inspectors may confer privately with employees, and any employee may bring to the attention of the inspectors any past or present condition which they believe contributed to or caused any violation as described above.

#### RAISING CONCERNS

No licensee or registrant shall discharge or in any manner discriminate against any worker because the worker has filed any complaint, or instituted or caused to be instituted any proceeding, or has testified or is about to testify in any proceeding, or because of the exercise by the worker on behalf of the worker or others of any option afforded by the regulations.

#### POSTING REQUIREMENT

Copies of this notice must be posted in a sufficient number of places where employees are engaged in activities licensed or registered pursuant to parts 2 and 3 of the Kansas Radiation Protection Regulations, to permit individuals the opportunity to observe a copy of this notice while on the way to or from the above mentioned activities.

## Transporting Sealed Sources to Field Locations, Securing Exposure Devices and Storage Containers in Vehicles, Posting of Vehicles, and Control of Sealed Sources during Transportation

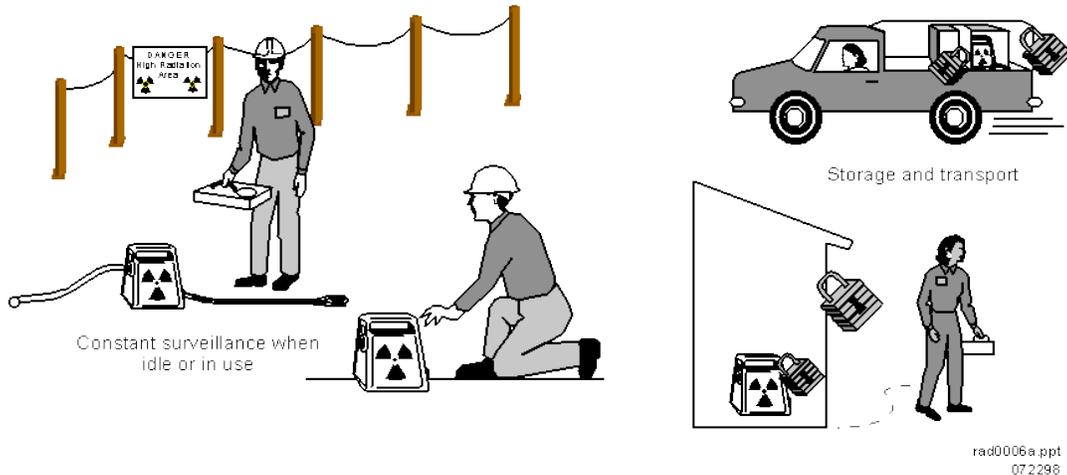
Regulation 28-35-195a and 28-35-196a of Part 3 requires that transport of licensed material be carried out in accordance with the applicable requirements of the Department of Transportation. Consult the Department of Transportation's (DOT's) regulations for detailed information about transportation requirements. Instructions to personnel should not reference DOT requirements. Information should be extracted and placed into the instructions so that personnel know exactly what they are expected to do. The following items should be covered in instructions to personnel:

1. Labeling containers with the appropriate label as specified in Sec.172.403 of 49 CFR Part 172 of the DOT's regulations, i.e., instruction on how to determine which label (Radioactive White I, Radioactive Yellow II, or Radioactive Yellow III) must be used.
2. Securing the exposure device or storage container within the transporting vehicle. The instructions should specify how the package is to be secured in the vehicle so that it cannot move during transport.
3. Placarding both sides, the front, and the back of the vehicle with "Radioactive" placards if the package being transported requires a Radioactive Yellow III label. Sections 172.519 of 49 CFR Part 172 of the DOT's regulations contains the specifications for the placards.

4. Surveying the exterior surfaces and passenger compartment of the vehicle to ensure that the radiation levels do not exceed 2 milliroentgens per hour at 18 inches (45 cm) from any exterior surface and 2 milliroentgens per hour in the passenger compartment. Include instructions to personnel on the measures that should be taken if the radiation level exceeds 2 milliroentgens per hour in the passenger compartment. For example, instruct them to add more shielding or reposition the device within the vehicle.

A vehicle used for transport could also be used for storage at a temporary job site. If the vehicle will be used for storage, there should be instructions to personnel about proper posting of the vehicle. The RADIOACTIVE placards that would be on the vehicle if a package with Radioactive Yellow III label were transported should be removed and "Caution - Radioactive Material" signs should be substituted. The radiation level may not exceed 2 milliroentgens per hour at 18 inches (45 cm) from any external surface of the vehicle. The vehicle should, of course be locked when it is used for storage.

### Security



### Licensees must ensure the security and control of licensed material.

Regulation 28-35-222a require licensees to secure radioactive materials from unauthorized removal or access while in storage and to control and maintain constant surveillance over licensed material that is not in storage.

## National Source Tracking Transaction Report (NSTS).

“Reports of transactions involving nationally tracked sources,” require that each licensee who manufactures, transfers, receives, disassembles, or disposes of a nationally tracked source shall complete and submit a National Source Tracking Transaction Report (NSTS). The NSTS is a major security initiative of the NRC. The NSTS is a secure, accessible and easy-to-use computer system that tracks high-risk radioactive sources from the time they are manufactured or imported through the time of their disposal or export, or until they decay enough to no longer be of concern.

The State of Kansas in 2005 began issuing Orders imposing security requirements on licensees who possessed radioactive materials quantities of concern (RAMQC). The Orders required licensees to implement enhanced security to control access to RAMQC and to protect sensitive security-related information. In 2007, the Department issued additional Orders to the same licensees requiring fingerprinting and criminal history records checks for unescorted access to RAMQC. The specific radionuclides and associated thresholds were based on the Category 1 and Category 2 quantities described in the International Atomic Energy Agency’s “Code of Conduct on the Safety and Security of Radioactive Sources.”

**When preparing an application or a renewal, you should send us the preliminary design of your security, such as, a building/storage sketch, types of locks used on doors or cages, and if you are using the following: alarms, cameras, motion detectors, etc. DO NOT send the Department: alarm codes, areas where motion detectors are located and other security confidential information. These items will be reviewed during a scheduled inspection of your License.**

## Transportation

Applicants must develop, implement, and maintain safety programs for public transport of radioactive material to ensure compliance with DOT regulations.

A carrier may not transport a hazardous material by motor vehicle unless each of its hazmat employees involved in that transportation is trained as required by this part and subpart H of part 172 of this subchapter. **A hazmat employee must receive the training required by this subpart at least once every three years.**

## Minimizing Exposure of Persons in the Event of an Accident--Emergency Procedures

An emergency situation is considered to exist whenever an abnormal event occurs, e.g., failure of a source to return to the safe storage position. Since it is not possible to list or specify all possible situations that would constitute an emergency, a general instruction is acceptable.

Radiography personnel should not attempt to perform operations involving retrieval or recovery of a source not in the shielded position unless they have had specific instruction and actual practice in retrieval operations with a dummy source. If you intend that radiographic personnel perform source retrieval or recovery, include in your training program a description of the instructions they will receive, including

practice with a dummy source. In addition, include specific instructions for source retrieval in your operating and emergency procedures.

Unless personnel have had instruction and training in source retrieval or recovery, include the following instructions to personnel:

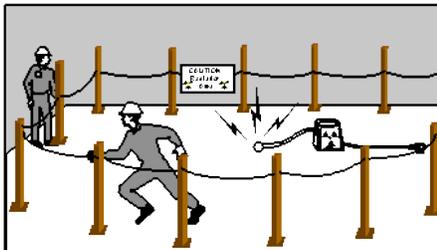
1. Establish and post the controlled area at the 2 milliroentgens per hour radiation level.
2. Maintain continuous surveillance of the controlled area until the situation is corrected.
3. Notify management or other appropriate persons.

In addition, describe the action to be taken by management.

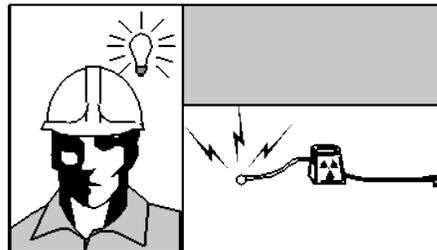
### Notification of Proper Persons in the Event of an Accident

In the emergency procedures, clearly identify the names and telephone numbers of management or supervisory personnel to be notified in the event of an accident. The individuals to be notified should be those persons who are in a position to take appropriate action in an emergency or accident. Such persons could also include those in police and fire departments, depending on the emergency or the Bureau of Environmental Health, Radiation Control Program.

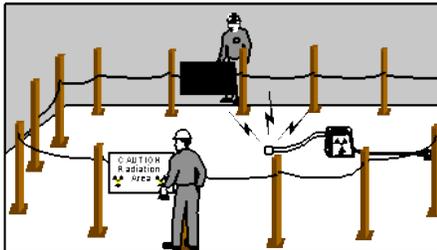
1. Move Away from Source at Once



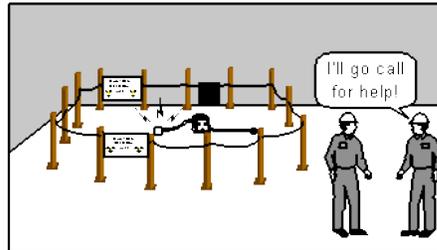
2. Calm Down and Think



3. Reconfirm Restricted Area (2mR/hr)



4. Maintain Surveillance



5. Call the RSO



rad0005e.ppt  
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## **Maintenance of Records**

When a license is granted, certain records must be generated and maintained. Among these are records generated by radiography personnel during the performance of radiography, including:

1. Utilization logs as required by 28-35-281. The instructions to personnel should clearly specify the need for the utilization log. The elements required are:
  - a. The make and model number of the device used.
  - b. Identification of the radiographer.
  - c. Where the device is used and the date.
2. Records of daily inspection of equipment as required by Regulation 28-35-287. Instructions to personnel should specify that a record be made of the daily inspection.
3. Pocket dosimeter readings as required by 28-35-284. These readings should be made at the beginning and end of a work shift. Instructions to personnel must specify that the readings be recorded.
4. Instructions to personnel should specify that a record of the final survey be made. Results of the physical survey following the final exposure of the day or operation as required by 28-35-287.

There may be other operations performed by radiography personnel for which records should be generated. These operations may include quarterly inspection and maintenance, instrument calibration, shipment of packages, etc. If management requires radiographers to perform operations associated with the performance of radiography, the instructions dealing with these operations should include instruction for an appropriate record of the performance of the operation.

## **Daily Inspection and Maintenance of Exposure Devices and Storage Containers**

Regulation 28-35-282a requires that radiographic exposure devices, storage containers, and source changers be checked for obvious defects prior to use each day the equipment is used.

The instructions to personnel must clearly reflect the regulatory requirement that the daily inspection be performed each day before the equipment is used. If equipment is used on more than one shift during a day, the equipment should be checked at the start of each shift.

Specify in the instructions to personnel the items that must be checked and the steps to be taken if any defects are found in the equipment. Manufacturers of the equipment can provide a list of items that should be checked in the daily inspection. A record of the performance of the daily inspection should be made.

## Procedure for Identifying and Reporting Defects and Noncompliance

If radiography personnel discover any malfunction or defect in radiography equipment, management should be notified so that it can take appropriate action. Instructions to personnel should require management notification if equipment malfunctions or defects are found.

## Other Tasks

As indicated earlier in this guide, radiography personnel may be assigned responsibility for carrying out other operations such as source exchange, quarterly inspection and maintenance of equipment, and leak-testing. If radiography personnel are assigned such tasks, specific instructions for performance of the tasks should be included in the operating and emergency procedures.

## Leak Test

The Department requires testing to determine whether there is any radioactive leakage from the source in the device. The Department finds testing to be acceptable if it is conducted by an organization licensed by the NRC or an Agreement State. Licensees must maintain records of test results.

Manufacturers, consultants, and other organizations may be authorized by the NRC or an Agreement State to either perform the entire leak test process for other licensees or provide leak-test kits to licensees. Leak test samples should be collected at the most accessible area where contamination would accumulate if the sealed source were leaking.

Regulation 28-35-279 contains the requirements for leak-testing sealed sources.

## Maintenance. Quarterly Maintenance

Regulation 28-35-282a contains the requirements for inspection and maintenance of radiographic exposure devices, transport and storage containers, associated equipment, source changers, and survey instruments. The licensee shall have written procedures for inspecting and maintaining radiographic equipment.

**Item 15 - Waste Disposal:** Provide the means of disposal. Sealed sources containing radioactive material may be returned to the manufacturer, transferred to another licensee authorized to possess the specific quantity and form being transferred, or transferred to a licensed waste disposal firm.

**NOTE:** Before transferring radioactive material, the licensee must verify that the recipient is properly authorized to receive the licensed material.

**Item 16 – Certificate:** Your application should be dated and signed by a representative of the corporation or legal entity who is authorized to sign official documents and to certify that the

application contains information that is true and correct to the best of their knowledge and belief. Unsigned applications will be returned for proper signature.

## V. Amendments and Renewals

### AMENDMENTS TO A LICENSE

After you are issued a license, you must conduct your program in accordance with:

- (1) The statements, representations, and procedures contained in your application
- (2) The terms and conditions of the license, and
- (3) The Kansas Radiation Protection Regulations.

It is your obligation to keep your license current. You should anticipate the need for a license amendment insofar as possible. If any of the information provided in your application is to be modified or changed, submit an application for license amendment. In the meantime, you must comply with the terms and conditions of the license until it is actually amended; you may not implement changes on the basis of a submission requesting an amendment to your license.

Examples of the more common amendments to licenses for industrial radiography include:

1. Addition of a new source/exposure device/source changer combination.
2. Change in your organizational structure, e.g., persons responsible for the conduct of the radiography program.
3. Addition of a new location of use or storage.

For example, if you wish to add a new source/device/source changer combination, you should review your operating and emergency procedures to ensure that changes are made to accommodate the new equipment, including instruction for use and daily inspection; quarterly inspection and maintenance and leak-testing need to be considered.

Similarly, in the application for a license amendment, you should consider the impact that the change will have on other documents. Any necessary modification of documents or procedures should be submitted so that additional correspondence will not be necessary.

An application for a license amendment may be submitted either on the application form (Kansas Form RH-1) or in letter form (in duplicate) and sent to the address specified on the front of this guide. Your application or letter should identify your license by number and should clearly describe the exact nature of the changes, additions, or deletions. You should make clear and specific references to previously submitted information and documents, and you should identify the pertinent information by date, page, and

paragraph. For example, if you wish to make a change in the individual responsible for the radiation safety program, the application for a license amendment should not only specify the name of the new individual but also include his or her training and experience. Moreover, the qualifications for the new individual should be equivalent to those specified in item 7 of this regulatory guide.

### **RENEWAL OF A LICENSE**

Licenses are issued for a period of 5 years. Send a completed RH-1 application for renewal in its entirety to the address specified in this guide. Provide all the information required as if it were an application for a new license without referring to previously submitted information.

As an alternative, you may:

1. Review the current license to determine whether the information concerning sealed sources, radiographic devices, etc., accurately represents the current and anticipated program. Identify any additions, deletions, or other changes and then prepare information appropriate for the required changes.
2. Review the documents submitted in the past to determine whether the information in them is up to date and accurately represents the facilities, equipment, personnel, radiation safety procedures, locations of use, and so on. The documents provided to represent the current program should be identified by date. Identify any out-of-date or superseded documents make in the documents, as necessary, to reflect the current program.
3. Review Kansas' current regulations to ensure that any changes in the regulations are appropriately covered in your program description.
4. After the review is completed, submit a letter to the Radiation Control Program requesting renewal of the license and providing the information specified in Items 1, 2, and 3, as necessary.
5. Include the name, telephone number and email of the person who may be contacted about the renewal application and include a current mailing address if it is not stated correctly on the license.

If the application for license renewal is filed at least 30 days before the expiration date, the license will automatically remain in effect until the Radiation Control Program takes final action on the application. However, if the application is filed less than 30 days before the expiration date and the Radiation Control Program cannot process the application before the license expires; the applicant would be without a valid license when the license expires.

If the license will not be renewed, the licensee must dispose of all licensed radioactive material possessed under the license in a manner authorized by Part 4. Complete Form RH-13 "Request to Terminate Kansas Radioactive Materials License" and return it before the expiration date of the license with a request that the license be terminated. If all the licensed radioactive material possessed under the license cannot be disposed of before the expiration date, a license renewal application should be requested for

storage only of the radioactive material in order to avoid violating the requirement that licensable material may not be possessed without a valid license

**Vacating any Facility** K.A.R. 28-35-184a.

Each licensee shall file written notice with the secretary 30 days before vacating any facility when the licensee decides to permanently discontinue all activities involving licensed materials authorized in that facility under the license

VI. **Material Receipt and Accountability**

Licensees must do the following:

- \_ Maintain records of receipt, transfer, and disposal of sources; and
- \_ Conduct physical inventories at intervals not to exceed 3 months.

**Inventories**

Physical inventories will be conducted and documented at quarterly intervals (not to exceed 3 months) to account for all sealed sources containing byproduct material and devices containing depleted uranium received and possessed under the license."

## APPENDIX A

### **Suggested Example of typical Radiation Safety Officer Duties and Responsibilities**

The RSO's duties and responsibilities include ensuring radiological safety and compliance with department regulations and the conditions of the license.

Typically, these duties and responsibilities include ensuring the following:

- a) Stopping unsafe activities involving licensed material;
- b) Radiation exposures are ALARA;
- c) Up-to-date radiation protection procedures in the daily operation of the licensee's byproduct material program are developed, distributed, and implemented;
- d) Possession, use, and storage of licensed material are consistent with the limitations in the license, the regulations, the SSDR Certificate(s), and the manufacturer's recommendations and instructions;
- e) Proper use and maintenance of radiography equipment;
- f) Personnel training is conducted and is commensurate with the individual's duties regarding licensed material;
- g) Proper use, maintenance and calibration of radiation survey meters;
- h) Personnel monitoring devices are used and exchanged at the proper intervals, and records of the results of such monitoring are maintained;
- i) Licensed material is properly secured;
- j) Documentation is maintained to demonstrate, by measurement or calculation, that the total effective dose equivalent to the individual likely to receive the highest dose from the licensed operation does not exceed the annual limit for members of the public;
- k) Proper authorities are notified of incidents such as loss or theft of licensed material, damage to or malfunction of sealed sources, and fire;
- l) Performance of worker audits;
- m) Audits of the radiation protection program are performed at least annually and documented;
- n) If violations of regulations, license conditions, or program weaknesses are identified, effective corrective actions are developed, implemented, and documented;

- o) Licensed material is transported, or offered for transport, in accordance with all applicable DOT requirements;
- p) Licensed material is disposed of properly;
- q) Appropriate records are maintained; and
- r) An up-to-date license is maintained and amendment and renewal requests are submitted in a timely manner.

**APPENDIX B**

**Suggested Example of Six-Month Radiographer/Radiographer's Assistant  
Inspection Checklist**

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Radiographic Location: \_\_\_\_\_

Radiographer/Radiographer Assistant: \_\_\_\_\_

**Last Six-Month Performance Observation: Date: \_\_\_\_\_ By: \_\_\_\_\_**

Device Model No.: \_\_\_\_\_ Serial No.: \_\_\_\_\_

Survey Meter Functionality: Yes \_\_\_\_\_ No \_\_\_\_\_

Calibrated: Yes \_\_\_\_\_ No \_\_\_\_\_ Daily/Source Check for Operation: Yes \_\_\_\_\_ No \_\_\_\_\_

Dosimetry: TLD/Film Badge and Pocket Dosimeter: Yes \_\_\_\_\_ No \_\_\_\_\_

Calibrated: Yes \_\_\_\_\_ No \_\_\_\_\_

Alarming Dosimeter: Yes \_\_\_\_\_ No \_\_\_\_\_ Calibrated: Yes \_\_\_\_\_ No \_\_\_\_\_

- Were other individuals working within the restricted area wearing film badges/TLDs, dosimeters, and alarm dosimeters?
- Was the restricted area posted with a "CAUTION (or DANGER) RADIATION AREA" sign(s)?
- Was the restricted area properly controlled to prevent unauthorized entry?
- Was the high-radiation area posted with a "CAUTION (OR DANGER) HIGH-RADIATION AREA" sign(s)?
- Was the utilization log properly filled out?
- Did the radiographer/radiographer assistant have sufficient knowledge of safety rules? (Ascertained by oral questions)
- Was the radiographer working with properly inspected and operable equipment?
- Did the radiographer/radiographer assistant properly survey the source projector?
- Did the radiographer properly supervise the radiographer assistant?

- Was the source projector properly locked and secured to prevent unauthorized removal?
- Was the restricted area properly controlled for radiological exposure?
- Were calculations or surveys performed to determine the restricted area boundary?
- Was the high-radiation area under continuous direct observation except where entry had been prevented?
- Were radioactive isotopes stored properly and kept locked to prevent removal?
- Was the storage area posted with a “CAUTION (or DANGER) RADIOACTIVE MATERIAL” sign(s)?
- Did the radiographer/radiographer assistant possess and use a copy of the operating and emergency procedures and (State or NRC) rules and regulations for protection against radiation?
- Were there any other safety items found to be lacking? If yes, explain in Remarks.

**Remarks:**

## APPENDIX C

### **Information for Applicants To Consider When Developing Procedures for Operating Radiography Equipment**

Caution: Always use a calibrated, operable survey meter and wear proper dosimetry while performing the following operations:

#### **Crankout Device**

- Establish and post the restricted area and high-radiation area.
- Locate the source shield at the desired distance from the object to be radiographed.
- Mount the source tip firmly, using jigs or other attachments, with the tip in the exact exposure position.
- Locate the control unit at a maximum distance from the source shield with the control tubes laid out as straight as possible.
- Join the control cable to the unit following the manufacturer's instructions.
- Unlock the device.
- Turn the handcrank steadily to move the source out of the source shield to the exposure position.
- Survey the perimeter of the restricted area to be sure that radiation levels do not exceed 0.02 millisievert (mSv) (2 millirem (mrem)) in any 1 hour.
- Maintain continuous surveillance over the restricted area during an exposure, keeping all persons from entering.
- After completing the exposure, retract the source by turning the crank until the "safe" position is indicated.
- Survey the entire circumference of the device and the guide tube to determine that the source is in a shielded position.
- Lock the device and remove the key.

#### **Pipeline Device**

- Establish and post the restricted area and high-radiation area.
- Unlock the device.

- Stand as far away as possible and out of the direction of the beam and expose the source (e.g., use the “stretch technique”).
- Survey the perimeter of the restricted area to be sure that the radiation levels do not exceed 0.02 mSv (2 mrem) in any 1 hour.
- Maintain continuous surveillance over the restricted area during an exposure, keeping all persons from entering.
- After completing the exposure, return the source to the shielded position.

### **Removing the Old Source**

- (1) Survey the shipping container upon receipt with a survey meter. Note that the surface reading should not exceed 2 millisievert per hour (mSv/h) (200 millirem per hour (mrem/h)).
- (2) Attach the end of the source guide tube to the exposure device.
- (3) Connect the other end of the source guide tube to the empty side of the source changer.
- (4) Unlock the empty side of the source changer.
- (5) Unlock the camera and crank out the source from the camera into the source changer.
- (6) Survey the source changer and guide tube to verify that the source is in the safe position.
- (7) Lock the source changer.
- (8) Disconnect the source guide tube and drive cable to the source pigtail. Replace the dust cap on the source changer.
- (9) Remove the source identification plate from the exposure device and affix the plate to the side of the source changer loaded with the old source.

### **Installing the New Source**

- (1) Remove the dust cap on the source changer lock body identified with the new source tag.
- (2) Align the camera and source guide tube with the source changer.
- (3) Connect the new source to the drive cable.
- (4) Connect the source guide tube to the source changer.
- (5) Unlock the source changer and retract the new source into the exposure device.

- (6) Survey the exposure device and guide tube to ensure that the source is in the safe position.
- (7) Lock the exposure device.
- (8) Disconnect the source guide tube and drive accessories.
- (9) Affix the new source identification plate on the exposure device.

## APPENDIX D

### Suggested Example of a Routine Emergency Procedure

#### Emergency Procedure

If the source fails to return to the shielded position or if any other emergency or unusual situation arises (e.g., vehicle accident, off-scale dosimeter), take the following actions:

- Immediately secure the area and post the restricted area at the 0.02 millisievert per hour (mSv/h) (2 millirem per hour (mrem/h)) radiation level; maintain continuous surveillance and restrict access to the restricted area.
- Notify the radiation safety officer (RSO) or management personnel.
- Take no further actions until instructions are received from the RSO.
- Do not attempt source retrieval until the situation has been discussed with the RSO or other knowledgeable personnel.
- Do not panic. Source retrieval can be performed with very little exposure when properly planned by trained personnel who are specifically authorized by the U.S. Nuclear Regulatory Commission (NRC) or an Agreement State to conduct source retrieval operations.
- Notify the persons listed below of the situation, in the order shown.  
Name\*  
Work Phone Number\* Home Phone Number\*  
\* Fill in with (and update, as needed) the names and telephone numbers of appropriate personnel (e.g., the RSO or other knowledgeable licensee staff, licensee's consultant, device manufacturer) to be contacted in case of emergency.
- Follow the directions provided by the person contacted above.

#### **Radiation Safety Officer and Licensee Management**

Discuss emergency operating procedures, and ensure no operations are conducted until the situation has been discussed with and approved by the RSO or other knowledgeable staff, consultants or device manufacturer. Management should have access to emergency equipment to keep doses to radiographers as low as reasonably achievable. Emergency equipment may include high-range dosimeters, extra lead shielding, or remote tongs. Notify local authorities as well as the Department as required.

Reports to the Department must be made within the reporting timeframes specified by regulation 28-35-229a. **Notification of incidents...**

**Appendix E**  
**K.A.R. Part 7 License Audit**

**Licensing Industrial Radiographic Operations**

License items	Check
<b>28-35-181g. Licensing for industrial radiography operations.</b>	
1-description of a program for training radiographers and radiographer's assistants	
2-procedures for verifying and documenting the certification status of radiographers	
3-written operating and emergency procedures	
4-description of a program for inspections of the job performance of each radiographer and radiographer's assistant at intervals not to exceed six months;	
5-program for inspection and maintenance of radiographic exposure devices, equipment, and storage containers to ensure proper functioning	
6-organizational structure as it applies to the radiation safety responsibilities in industrial radiography	
7-qualifications of the individual designated as the radiation safety officer	
8-procedures for performing leak tests	
identification and description of the location of each field station and permanent radiographic installation	
identification of each location where all records required by this part and the other parts of these regulations will be maintained	
<b>28-35-276. Locking sources of radiation</b>	
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.	
shall be physically secured to prevent tampering or removal by unauthorized personnel	
<b>28-35-277a. Conducting industrial radiographic operations.</b>	
If radiography is performed at a location other than a permanent radiographic installation, the radiographer shall be accompanied by at least one other qualified radiographer or an individual	
<b>28-35-278. Radiation survey instruments</b>	
The instrumentation required by this subsection shall have a range capable of measuring two milliroentgens per hour through one roentgen per hour.	
Calibrated at intervals not to exceed six months and after each instrument servicing;	
Each licensee or registrant shall maintain records of the calibrations specified in this regulation for two years after the calibration date.	
<b>28-35-279. Leak testing, repair, tagging, opening, modification, and replacement of sealed sources.</b>	
shall be performed only by persons specifically authorized to do so by the department, the United States nuclear regulatory commission, or an agreement state.	
Each sealed source shall be tested for leakage at intervals not to exceed six months.	
The leak test shall be capable of detecting the presence of 0.005 microcuries of removable contamination.	
Each exposure device using depleted uranium (DU) shielding and an S-tube configuration shall be tested for DU contamination at least each 12 months.	

License items	Check
<b>28-35-280. Quarterly inventory</b>	
Each licensee shall conduct a quarterly inventory to account for all sealed sources and for all devices containing depleted uranium received or possessed by the licensee. The licensee shall maintain these inventory records for two years	
<b>28-35-281. Utilization logs.</b>	
Each licensee or registrant shall maintain a log for each source of radiation	
<b>28-35-282. General requirements.</b>	
Each licensee or registrant shall conduct an internal audit program to ensure that the agency's radioactive material license conditions and the licensee's or registrant's operating and emergency procedures are followed by each radiographer and radiographer's assistant.	
These internal audits shall be performed at least quarterly, and each radiographer shall be audited at least quarterly. A record of each internal audit shall be maintained for departmental inspection for two years	
<b>28-35-282a. Inspection and maintenance of radiation machines, radiographic exposure devices, transport and storage containers, associated equipment, source changers, and survey instruments.</b>	
Each licensee or registrant shall perform visual and operability checks on the survey meters, radiation machines, radiographic exposure devices, each transport and storage container, and any associated equipment and source changers before each day's use, or each work shift	
Each licensee or registrant shall maintain records of inspection, equipment problems, and any maintenance performed under this regulation for three years	
<b>28-35-282b. Permanent radiographic installations.</b>	
both conspicuous visible and audible warning signals to warn of the presence of radiation	
The alarm system shall be tested for proper operation with a radiation source each day before the installation is used for radiographic operations. The test shall include a check of both the visible and audible signals	
The test records for entrance controls and audible and visual alarms shall be maintained for three years.	
<b>28-35-282c. Labeling, storage, and transportation.</b>	
The licensee shall lock and physically secure all transport packages containing radioactive material in the transporting vehicle to prevent accidental loss, tampering, and unauthorized removal	
The licensee's name and the name of the city or town where the main business office is located shall be prominently displayed by affixing a durable, clearly visible label on each side of any vehicle used to transport radioactive material or radiation machines for temporary use at a job site.	
<b>28-35-282d. Radiation safety officer</b>	
The minimum qualifications, training, and experience for a radiation safety officer for industrial radiography	
1-Completion of the training and testing requirements of K.A.R. 28-35-289	
2-2,000 hours of hands-on experience as a qualified radiographer in industrial radiographic operations	

License items	Check
<b>28-35-282d. Radiation safety officer -continue</b>	
3-formal training in the establishment and maintenance of a radiation protection program.	
4-The specific duties and authorities of the radiation safety officer	
<b>28-35-283. Operating and emergency procedures.</b>	
the proper handling and use of sources	
conducting radiation surveys	
controlling access to areas where radiography is being performed	
locking and securing sources of radiation, transport containers, storage containers, and exposure devices	
personnel monitoring and the use of personnel- monitoring equipment	
transporting sources of radiation to field locations	
procedures for minimizing the exposure of individuals if an accident, including a source disconnect, transport accident, or loss of a source of radiation, occurs	
source recovery procedures (if the licensee will perform source recoveries)	
the procedures for notifying the appropriate persons if an accident occurs	
the maintenance of records	
the inspection, maintenance, and operability checking of radiographic exposure devices, storage containers, transport containers, radiation machines, survey instruments, and alarming ratemeters.	
<b>28-35-284. Personnel monitoring.</b>	
shall not permit any individual to act as a radiographer or a radiographer's assistant unless, at all times during radiographic operations, each individual wears on the trunk of the body a personnel-monitoring device	
a direct reading dosimeter, and an alarming ratemeter	
each pocket ion-chamber dosimeter shall have a range from zero to 200 mrem and shall be recharged at the start of each work shift	
Electronic personal dosimeters may be used in place of only pocket ion-chamber dosimeters.	NOTE
Each PMD shall be exchanged at least monthly.	
All pocket ion-chamber dosimeters and electronic personal dosimeters shall be checked at least each 12 months for the proper response to and the accurate measurement of radiation, and records shall be maintained for two years.	
each alarming ratemeter is set to give an alarm signal at a preset dose rate of 500 mrem per hour, AND is calibrated at least each 12 months for the accurate measurement of radiation.	
<b>28-35-287. Radiation surveys and survey records</b>	
available and used at each site where radiographic exposures are made.	
<b>28-35-289. Training requirements-Radiographer</b>	
act as a radiographer until the individual has completed both of the following	
1-At least 40 hours of training in the subjects specified in subsection (g) of this regulation; AND	
2-on-the-job training consisting of hands-on experience under the supervision of a radiographer and certification through a radiographer certification program by a certifying entity	
On-the-job training that includes at least two months or 320 hours of active participation in the performance of industrial radiography utilizing radioactive material	
utilizing radiation machines, on-the- job training that includes at least one month or 160 hours	

License items	Check
<b>28-35-289. Training requirements-Radiographer</b>	
shall not permit any individual to act as a radiographer until the individual meets the following requirements:	
Has received the following	
1-A copy of and instruction in the requirements contained in part 7; AND a copy of the applicable portions of parts 4 and 10 of these regulations;	
2-copy of the license	
3-copy of the operating and emergency procedures	
4-completion of a written or oral examination (reference to the items above)	
5-has received training in the use of the registrant's radiation machines, or the licensee's radiographic exposure services and sealed sources, in the daily inspection of devices and associated equipment and in the use of radiation survey instruments--by successful completion of a practical examination	
<b>Training requirements-Radiographer's Assistant</b>	
under the personal supervision of a radiographer, has received training in the use of the registrant's radiation machines, or the licensee's radiographic exposure devices and sealed sources, in the daily inspection of devices and associated equipment and in the use of radiation survey instruments	
Has received the following	
1-A copy of and instruction in the requirements contained in part 7; AND a copy of the applicable portions of parts 4 and 10 of these regulations;	
2-copy of the license	
3-copy of the operating and emergency procedures	
4-completion of a written or oral examination (reference to the items above)	
5-has received training in the use of the registrant's radiation machines, or the licensee's radiographic exposure services and sealed sources, in the daily inspection of devices and associated equipment and in the use of radiation survey instruments--by successful completion of a practical examination	
<b>Training requirements-Both</b>	
Each radiographer and radiographer's assistant shall receive the annual refresher safety training at least every 12 months	
Observation of the performance of each radiographer and radiographer's assistant during an actual industrial radiographic operation, at least every six months	
The training of each licensee or registrant shall include information about the following:	
1-Fundamentals of radiation safety	
2-The characteristics of gamma radiation and X-radiation	
3-the units of radiation dose and activity	
4-the hazards of exposure to radiation	
5-the levels of radiation from different sources of radiation	
6-methods of controlling radiation dose using time, distance, and shielding	
7-The use, operation, calibration, and limitations of radiation survey instruments	
8-survey techniques	
9-use of personnel-monitoring equipment;	
10-operation and control of radiographic exposure equipment, remote handling equipment, and storage containers, including pictures or models of source assemblies	

License items	Check
<b>Training requirements-Both</b>	
11-the operation and control of radiation machines	
12-the storage, control, and disposal of sources of radiation	
13-inspection and maintenance of equipment	
14-the requirements of state and federal regulations	
15-case histories of accidents in radiography	
<b>28-35-292. Location of documents and records - field station and each temporary job site</b>	<b>NOTE</b>
1-license or registration	
2-a copy of parts 1, 4, 7, and 10	
3-utilization logs	
4-the records of any equipment problems identified in daily checks of equipment	
5-records of alarm systems and entrance control checks, if applicable	
6-records of all dosimeter readings	
7-operating and emergency procedures	
8-latest calibration of the radiation survey instruments in use at the site;	
9-latest calibrations of alarming ratemeters and operability checks of dosimeters	
10-survey records for the period of operation at the site	
11-shipping papers for the transportation of radioactive materials	

**Appendix F**  
**Safety Culture**

## **Safety Culture**

It is the KDHE's expectation that individuals and organizations performing regulated activities establish and maintain a positive safety culture commensurate with the safety and security significance of their activities and the nature and complexity of their organizations and functions. This applies to all licensees, certificate holders, permit holders, authorization holders, holders of quality assurance program approvals, vendors and suppliers of safety related components, and applicants for a license, certificate, permit, authorization, or quality assurance program approval, subject to KDHE authority.

"Nuclear safety culture" is defined as the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure protection of people and the environment. Individuals and organizations performing regulated activities bear the primary responsibility for safely handling and securing these materials.

Experience has shown that certain personal and organizational traits are present in a positive safety culture. A trait, in this case, is a pattern of thinking, feeling, and behaving that emphasizes safety, particularly in goal conflict situations (e.g., production versus safety, schedule versus safety, and cost of the effort versus safety).

The KDHE, as the regulatory agency with an independent oversight role, reviews the performance of individuals and organizations to determine compliance with requirements and commitments through its existing inspection and assessment processes. However, KDHE's safety culture policy statement and traits are not incorporated into the regulations. Many of the safety culture traits may be inherent to an organization's existing radiation safety practices and programs. For instance, the annual refresher training required for radiographers and radiographer assistants may correspond with the "continuous learning" safety culture trait in that the training provides an opportunity to learn about ways to ensure that safety is sought out and implemented.