ILLINOIS EMERGENCY MANAGEMENT AGENCY

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Instructions for Preparing Applications
for Radioactive Material Licenses Authorizing the

USE OF RADIOACTIVE MATERIAL FOR INDUSTRIAL RADIOGRAPHY

BUREAU OF RADIATION SAFETY
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I. INTRODUCTION

A. General

The Illinois Emergency Management Agency (herein referred to as IEMA or the Agency) regulates the possession and use of radioactive material and the use of radioactive sealed sources for non-destructive testing. This type of use is called industrial radiography and a specific license issued pursuant to 32 Illinois Administrative Code 330.260(d) and 350.4010 (the IEMA administrative rules, herein referred to as 32 Ill. Adm. Code or the regulations) is required.

The Agency usually issues a single radioactive material license to cover an entire radioactive material program. Separate licenses are not normally issued to different departments of a facility, nor are they issued to individuals associated with the facility. Facilities with more than one license may wish to combine those licenses where feasible.

B. Purpose of Instructions

These instructions describe the information needed by the Agency's Radioactive Materials Section staff to evaluate an application for a specific license for the possession and use of radioactive material for industrial radiography.

Prior to submitting an application for industrial radiography, the applicant should carefully study these instructions and the regulations listed in Section I.D., and submit all applicable information requested. The Radioactive Materials Section staff will request additional information when necessary to ensure that the applicant has established an adequate radiation safety program (see 32 Ill. Adm. Code 330). Such requests for additional information will delay final action regarding the application and may be avoided by a thorough study of the regulations and these instructions prior to filing the application.

These instructions are intended only for general guidance in the preparation of the license application and should not be considered as a substitute for the applicant's careful evaluation of the proposed use of radioactive material. Applicants must assure that the application correctly and adequately describes radiation safeguards and procedures to be followed in their radioactive material use program.

C. Purpose of Appendices to these Instructions

The regulations require licensees to develop and implement written policies and procedures which ensure compliance with the 32 Ill. Adm. Code. This instructional set's appendices provide sample radiation safety procedures which the licensee may choose to use in their radiation safety program. Applicants should carefully read the applicable regulations and sample procedures and then decide if the sample procedures are appropriate for their specific radiation safety needs. In the application, applicants may certify that they will follow a sample procedure or develop and submit an equivalent procedure for Agency review. If a sample procedure is followed, applicants must ensure that references to that procedure are clear and specific (e.g., references should include instructional set number, revision number, revision date and appendix identification).

D. Applicable Regulations

The following portions of the regulations are applicable to the use of radioactive material for industrial radiography and should be used in conjunction with these instructions:

1. 32 Ill. Adm. Code 310 - "General Provisions"

2. 32 Ill. Adm. Code 330 - "Licensing of Radioactive Material"

3. 32 Ill. Adm. Code 331 - "Fees for Radioactive Material Licenses"

4. 32 Ill. Adm. Code 340 - "Standards for Protection Against Radiation"

5. 32 Ill. Adm. Code 341 - "Transportation of Radioactive Material"

6. 32 Ill. Adm. Code 350 - "Radiation Safety Requirements for Industrial Radiographic Operations"

7. 32 Ill. Adm. Code 400 - "Notices, Instructions, and Reports to Workers; Inspections"

8. 32 Ill. Adm. Code 405 - "Certification of Individuals to Perform Industrial Radiography"

The Agency may amend these regulations periodically. The licensee will be notified of these changes as they occur and must incorporate them into their program, if applicable.

E. Retention of Records

The licensee must maintain certain records for specified periods of time for compliance purposes. These intervals have been established in order for the inspection staff and other authorized entities to have access to these documents as required by the regulations. 32 Ill. Adm. Code 350.Appendix C contains the retention requirements for these documents.

F. Radiation Protection Program

As specified in 32 Ill. Adm. Code 340.110, the licensee must develop, document, and implement a radiation protection program. Specifically, this program should include provisions for ensuring compliance with the requirements of Part 340 of the regulations, the license, the license conditions with all active amendments and the establishment of an ALARA program and for performance of reviews of the program at 12-month intervals. In developing a radiation protection program, the licensee should design the program based on the size of the facility, potential hazards associated with radiation exposure, the potential for intake of radioactive material and the physical characteristics of the radionuclides. The commitments made to the Agency, which lead to the issuance of the license, the regulations and the complete license document are considered the applicant's radiation protection program.

Active control over the radiation protection program should be exercised by management personnel in positions of authority. In addition, management should be aware that the assignment of duties to individuals (e.g., the Radiation Safety Officer, RSO) does not relieve management of the responsibilities to review and control the licensed activities.

G. As Low As is Reasonably Achievable (ALARA)

Persons engaged in activities authorized by radioactive material licenses issued by the Agency must, to the extent practicable, make every reasonable effort to maintain the release of radioactive material and the total effective dose equivalent (TEDE), ALARA, for both workers and members of the public. License applicants must give consideration to the ALARA philosophy when designing facilities, procuring equipment and developing procedures for work with radioactive material. The ALARA concept is a key element in establishing any radiation protection program as described above. The definition of ALARA may be found in 32 Ill. Adm. Code 310.20.

H. Systéme International (SI) Units

In accordance with State and federal policy, the Agency is making an effort to implement the SI system of units. If applicants wish to utilize SI units in their application, please feel free to do so. However, this conversion is by no means mandatory at this time. The Agency will continue to recognize SI and English units. Appendix A of this instructional set has been included to assist applicants in the use of SI units.

II. FILING AN APPLICATION

An application for a specific license for industrial radiography should be submitted on the "Application Form for Radioactive Material License for Industrial Radiography" in accordance with 32 Ill. Adm. Code 330.240(a) (see Exhibit A). All items on the application form must be completed in sufficient detail for the Agency staff to determine that the applicant's equipment, facilities and radiation protection program are adequate to protect health and minimize danger to life and property.

Since the space provided on the application form is limited, separate 8.5 by 11 inch sheets of paper may be appended for Items 5 through 17 listed on the form. Each appended sheet should contain the item number, page number, applicant's name, and the application date in the lower right corner.

The application should be completed in triplicate. The original and one copy of the application, along with duplicate copies of supporting documents, must be mailed to:

Illinois Emergency Management Agency
Radioactive Materials Section
Licensing Section
1035 Outer Park Drive
Springfield, Illinois 62704

At least one copy of the submitted application, with all attachments, must be retained by the applicant. When issued, the license will require, as a condition, that the licensee possess and use radioactive material described in all schedules of this license in accordance with statements, representations, and procedures contained in, or enclosed with, the application and supporting documentation. The regulations contained in 32 Ill. Adm. Code: Chapter II, Subchapters b and d shall govern unless the statements, representations, and procedures set forth in the licensee's application and correspondence are more restrictive than the regulations.

Unless the applicant is exempt, an application fee is required for a radioactive material license. Refer to 32 Ill. Adm. Code 331 to determine the appropriate fee that must accompany the application. Review of the application will not begin until the proper fee is received by the Agency. In addition, applicants may be required to file financial surety arrangements for reclaiming sites. The applicant should refer to 32 Ill. Adm. Code 330.250(c) or 332.260 for details regarding applicability to their program. Also, please note that 32 Ill. Adm. Code 330.320(c) requires licensees to submit either a renewal application or a termination request no less than 30 days before the expiration date of an existing license.

III. CONTENTS OF AN APPLICATION

The following paragraphs explain the information requested on the "Application Form for Radioactive Material License for Industrial Radiography" (Exhibit A):

Item 1 - Type of Application

Indicate, by checking the appropriate box, if the application is for a new license, an amendment to an existing license, or a renewal of an existing license. If the application is for an amendment to or a renewal of an existing license, please specify the existing Illinois Radioactive Material License Number in the space provided.

Item 2 - Applicant's Name and Mailing Address

The "applicant" is the organization or person(s) legally responsible for possession and use of the licensed radioactive material specified in the application. The applicant's mailing address may or may not be the same as the address where radioactive material will be used. An individual should be designated as the applicant only if that individual is acting in a private capacity, and the use of radioactive material is not connected with his or her employment with a corporation or other legal entity. Enter the name, mailing address (including ZIP code) and telephone number (including area code) of the applicant in the space provided.

Item 3 - Person to Contact Regarding the Application

The applicant should name a qualified individual who is authorized by the applicant's management to answer questions and make commitments regarding the application and the radiation safety program. This individual, usually the RSO or a principal radioactive material user, will serve as the point of contact during the application's review. In the space provided, enter the name, address and telephone number (including area code) of the individual to be contacted regarding the application.

Item 4 - Address(es) Where Radioactive Material will be Used and/or Stored

Specify all the addresses and physical locations where licensed radioactive material will be used and/or stored. Each location description should include the street address, city and other descriptive information (e.g., building name/number, suite, room or floor number) to allow specific facility identification. If multiple addresses will be used, then specify the extent of use at each location. Do not specify a post office box number as a use location.

The applicant should indicate if he owns the property where licensed activities will take place. If the applicant does not own the use/storage location(s), submit a letter from the owner of the property/facility which verifies that the owner is aware of and does not object to the use/storage of radioactive material on this property.

Use of temporary job sites should be requested by checking off the blank provided under Item 4 on the application. Use of licensed material at temporary job sites will become part of the license conditions and each separate address does not need to be specified as long as the licensee does not use or store radioactive material at any one site for more than 180 days during any twelve-month period.

Item 5 - Radiation Safety Officer

State the name and job title of the RSO. This person is designated by, and responsible to, the applicant's management for the coordination of the applicant's radiation safety program and for ensuring compliance with the applicable regulations and license provisions. For smaller companies, the RSO may be the management. The RSO's training and experience must meet the requirements of 32 Ill. Adm. Code 350.4020(b). This includes the possession of a high school diploma (or high school equivalency), completion of the training and testing requirements of 32 Ill. Adm. Code 350.2010(a)(2), (3) and (4), two years of documented experience with industrial radiographic operations and certification as an industrial radiographer as specified in 32 Ill. Adm. Code 350.2010(a)(1).

The RSO should be an on-site individual designated for each installation to assume the responsibilities of the office, to advise on the establishment of safe working conditions, and to assure that the installation is in compliance with all pertinent federal, state, and local regulations. The RSO's duties and responsibilities must comply with the requirements of 32 Ill. Adm. Code 350.4020(c). The RSO may designate certain duties to qualified individuals provided the terms of said designations are specifically outlined in the facility procedures. The RSO should be familiar with the basic principles of radiation protection in order to properly discharge the RSO's responsibilities, although for details the RSO may consult with appropriate qualified experts.

Item 6 - Radioactive Material for Industrial Radiography

Submit a detailed description of the radioactive material for which a license is desired. This description should include all the items listed in the following example:

Element and Mass Number.....Ir-192
Chemical and Physical Form .....Sealed Source
Source Manufacturer(s) and Model .....Amersham A424-9
Maximum Activity per Source.....3700 GBq (100 Ci)
Number of Sources Requested.....2
Device Manufacturer and Model .....Amersham 660 System
Intended Use .....For use in industrial radiography and source exchanges.

If source exchanges are to be performed by the licensee, the models and combinations of source exchangers/sources/cameras used must be specified. The licensee must ensure that the equipment used meets the requirements of 32 Ill. Adm. Code 350.1000. In addition, it is your responsibility to ensure that associated equipment use in industrial radiographic operations (i.e., source assemblies, drive cables, guide tubes, control tubes, cranks, "J" tubes, collimators, exposure heads and source stops) also meet the requirements of this section. If in doubt, you should check with the manufacturer of this equipment.

Item 7 - Instrumentation

Specify by manufacturer and model all radiation surveying/monitoring instruments and detectors to be used at the facility. This list shall include, but is not limited to, fixed area monitors, instruments for analysis of wipe tests, and instruments for performing physical radiation surveys. Instrumentation for performing physical area surveys must have a range such that 0.516 µC/kg (2 mR) per hour through 258 µC/kg (1 R) per hour can be measured. The applicant must submit calculations to show that the instrumentation used to analyze wipe test samples is sufficiently sensitive to detect 0.185 kBq (0.005 µCi). Appendix B contains information regarding minimum detectable activity calculations.

Exhibit B is a form that may be used to describe the applicant's instrumentation. If this form is not used, then submit equivalent information.

Item 8 - Instrument Calibration and Operability Checks

The licensee must ensure that the survey instruments used to demonstrate compliance with 32 Ill. Adm. Code 340.510(a) and 350.1040 are calibrated at intervals specified in 32 Ill. Adm. Code 350.1040(b). Specify, if survey instruments will be calibrated by a service company specifically licensed to perform survey instrument calibrations as a customer service or by the applicant using specified procedures.

If survey instruments are to be calibrated by the applicant, then the applicant must submit the information requested in Appendix C. If a consultant or other licensed firm will perform the calibration of the survey instruments, then the applicant must maintain a copy of the radioactive material license which authorizes that entity to perform survey instrument calibrations as a

customer service. If other instrumentation such as area monitors are to be calibrated as well, these should be addressed in this section.

In addition, 32 Ill. Adm. Code 350.1040(d) requires the licensee to check instrument operability by using a source of radiation (the gamma camera with the source in the locked and shielded position may be used). These instrument operability checks should be performed on each day that the instrument is used; however, a record of these checks should be made only after repair, battery change or instrument calibration.

Item 9 - Facilities and Equipment

A detailed description of the facility should be submitted which includes the following:

A. Annotated drawings or sketches of the facility and the surrounding area, including:

1. The diagram scale and location of areas of use/storage within each room;

2. The direction of north;

3. Description of construction materials used for shielding including dimensions and densities of materials;

4. All areas adjacent (e.g., beside, above and below) to radioactive material storage/use areas. Specify the distance to the closest occupied work station;

5. Identification of entrance ways;

6. The building, floor, room number and principal use of each room or area;

7. Any additional radiation safety equipment for rooms or areas such as remote handling equipment, storage containers, area monitors, alarms, interlocks, etc.; and

8. A description of security measures implemented to limit access to storage/use areas to only authorized individuals (e.g., locking doors and storage containers, keys possessed by authorized users only).

B. In addition, for permanent, enclosed systems, the following should be submitted (see 32 Ill. Adm. Code 350.1090 and 350.3050):

1. A description of the area safeguards, such as locks, signs, and interlocking systems for each enclosed exposure area and adjacent areas. A statement indicating that enclosed systems may be opened at all times from the inside should be included;

2. A description of the visible-audible signal system and its location. 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 while the source is exposed. These systems must be tested for proper operation prior to each day of industrial radiographic operations and after repair. No industrial radiography may be

performed if these systems are not operating properly. The requirement for the visible-audible signal system is in addition to any other measures that may be taken to prevent access into the facility;

3. In the event construction requirements preclude shielding the roof to meet the requirements of 32 Ill. Adm. Code 340.310 (a)(1) and (a)(3), provide the following information to obtain approval:

    1. Means of access to the roof;

    2. Procedures for ensuring that no individual is on the roof or could gain access to the roof during the performance of industrial radiography;

    3. A commitment that the roof, if accessible, will be posted with "Caution (or Danger) Radiation Area" signs; and

    4. The steps taken to minimize radiation levels on the roof.

    A radiation level that exceeds 25.8 μC/kg (100 mR) per hour will not be considered acceptable. This radiation level constitutes a high radiation area and requires special precautions such as the visible-audible signal system required by 32 Ill. Adm. Code 350.1090.

4. The results of radiation level calculations or actual radiation measurements adjacent to, above, and below the facility, including the roof, must not exceed 32 Ill. Adm. Code 340.320(b)(1). Clearly identify the radionuclide(s), the amount of radioactive material in the source(s), and the position of the source(s) within the facility. Use this information in the calculations or measurements;

5. Limitations (if needed) on positioning of sources or type (radionuclide) and amount of radioactive material that may be used in the facility to assure that areas adjacent to, above, and below the facility will be unrestricted areas when industrial radiography is performed.

A sample diagram can be found in Appendix D of this instructional set for your review.

Item 10 - Personnel Training Program

All individuals whose jobs may require them to access any portion of a restricted area must receive instruction as specified in 32 Ill. Adm. Code 400.120. In addition, 32 Ill. Adm. Code 350.2010, 350.4010(c)(1), 405.70 (405.Appendix A) and 405.80 require specific instruction for industrial radiographers and industrial radiographer trainees in certain topics, the regulations, the license, operating and emergency procedures and industrial radiographic equipment culminating in evaluations through written, oral and field examinations. Submit a description of the training that will be provided to all personnel who work with, or in the vicinity of, radioactive materials. This training description should include the form of training (e.g., formal course work, lectures, practical training), a list of topics covered in the training, the means used to evaluate the training (e.g., exam), passing grade required, the frequency of training, the duration of training, the name

and qualifications of the individual providing the training, and a sample of the training record to be maintained (or a description of such records content and the subject matter). The training program should be of sufficient scope to ensure that all personnel, including technical, clerical, maintenance, housekeeping, and security personnel, receive proper instruction. These topics may vary depending on staff member's job-related duties.

Regarding the frequency of personnel training, such training must be provided to personnel before assuming duties in, or performing duties requiring access to, any portion of a restricted area, at intervals not to exceed 12 months as refresher training, and whenever there is a significant change in duties, potential radiation hazards, regulations or the terms of the license.

32 Ill. Adm. Code 341 requires that no licensees may transport licensed material outside the confines of his plant or other place of use or deliver licensed material to a carrier for transport unless the transport and delivery is in compliance with the regulations of the U.S. DOT, 49 CFR 170-189. Note the training requirements listed in 49 CFR 172 for which you are responsible if transporting portable devices.

Appendix E contains guidance for an appropriate training agenda. This should be used in developing your training program.

Upon completion of training and before performing industrial radiography, 32 Ill. Adm. Code 405 also requires certification of all radiographic personnel. Exhibit C is the form used to apply for examination/certification.

Item 11 - Procedure for Ordering and Receiving Radioactive Material

Submit a description of procedures for ordering and receiving radioactive material including receipt during off-duty hours and notification of responsible persons upon receipt of radioactive material. This procedure should be adequate to meet the requirements of 32 Ill. Adm. Code 340.960, to ensure that possession limits are not exceeded, to ensure that arrangements are made to receive the package when offered for delivery, to ensure that radioactive material is secured at all times against unauthorized removal, to ensure that radiation levels in unrestricted areas do not exceed the limits specified in 32 Ill. Adm. Code 340.310 and to ensure that all receipts are properly documented.

Security personnel or any other individuals who receive packages of radioactive material during off-duty hours should be issued written procedures which detail receipt, examination and security for packages. Procedures should include notification procedures to be followed for packages found or suspected to be damaged and indicate the immediate steps to be taken to prevent the spread of contamination.

Appendix F contains a sample procedure and instructions for ordering and receiving radioactive material packages. Either indicate that the procedures contained in Appendix F will be followed or submit an alternate procedure for Agency review.

Item 12 - Procedure for Safely Opening Radioactive Material Packages

Submit procedures for examining incoming packages for contamination, or damage, and for

safely opening packages in accordance with 32 Ill. Adm. Code 340.960. Package monitoring should be performed as soon as practicable after receipt. This procedure may vary depending on the type and quantity of radioactive material received, but it should include instructions for surveying packages, checking packing material for contamination after opening if damage is suspected and verifying the contents of packages of radioactive material, not only against the packing slip, but also against the amount, type and form of material ordered. Even though 32 Ill. Adm. Code 340.960 exempts certain packages from monitoring, it is necessary that procedures be established for safely opening all radioactive material packages. Generally, 340.960(b)(2) requires that all industrial radiographic sources be surveyed for radiation levels upon receipt.

Appendix G contains a sample procedure for safely opening packages of radioactive material. Either indicate that the procedures contained in Appendix G will be followed or submit an alternate procedure for Agency review.

Item 13 - Operating and Emergency Procedures

32 Ill. Adm. Code 350.2010(a)(2) and 350.2010(b)(1) require each licensee to provide industrial radiography personnel with operating and emergency procedures. The purpose of these procedures is to provide personnel with clear and specific instructions concerning topics in 32 Ill. Adm. Code 350.2020 and other duties and responsibilities which industrial radiography personnel may have. Other duties could include instrument calibration, leak testing, source exchange, quarterly inspection and preventive maintenance of equipment and shipment of sources and devices. The operating and emergency procedures for personnel should not contain information which does not apply specifically to the duties of industrial radiography personnel (e.g., training program description, management control program, etc.).

The operating and emergency procedures should be tailored to fit the program proposed in the application. The procedures and instructions should be complete and self-contained in a single document. Information contained in the operating and emergency procedures should be in terms familiar to industrial radiography personnel.

No specific format for operating and emergency procedures is required. A sequential set of instructions which covers industrial radiography operations from the beginning of the work day to the end of the work day is an acceptable format. 32 Ill. Adm. Code 350.3045 requires that a minimum of two industrial radiographic personnel be present at all temporary job sites. This requirement should be considered when preparing your procedure.

A. The Handling and Use of Licensed Sealed Sources and Industrial Radiographic Exposure Devices

Step-by-step instructions for the use and handling of industrial radiographic exposure devices and related equipment should be provided. The procedures should include instructions for use of radiation collimating cones or other auxiliary shielding material. Instructions for "crankout" devices should be separate from those for "pipeliner" devices. Manufacturers' manuals and similar documents should not be submitted; rather, information should be extracted from these manuals and incorporated into your site specific procedures.

B. Methods and Occasions for Conducting Radiation Surveys

The procedures should identify survey sites, survey frequencies and acceptable radiation levels. A survey should be performed each time a source is manipulated or moved. Surveys that must be performed include:

1. Surveys after exposure to determine that the source has returned to the shielded position. This survey should include both the guide tube, collimators and the entire circumference of the device itself. Surveys of this type must be performed prior to exchanging films, repositioning collimators or dismantling the equipment;

2. Surveys prior to securing an industrial radiographic exposure device or storage container;

3. Surveys for determination of the perimeter of the restricted area;

4. Surveys of vehicles used for transporting sources and devices;

5. Surveys for determination of radiation levels at external surfaces of storage containers, including vehicles used for storage;

6. Surveys for determination that containers prepared for shipment comply with the requirements in U.S. Department of Transportation (DOT) regulations; and

7. Determination that sources are in a shielded position following source exchange and that radiation levels around source changers meet regulatory requirements.

The acceptable radiation levels for surveys should be expressed in □C/kg per hour or milliroentgen per hour.

C. Methods for Controlling Access to Industrial Radiographic Areas

Posting of radiation areas and high radiation areas is required by 32 Ill. Adm. Code 340.920. For industrial radiography at temporary job sites, it is acceptable to post the perimeter of the restricted area rather than the perimeter of the radiation area. Instruct personnel to post "Caution (or Danger) Radiation Area" signs at the calculated boundary and to make a confirmatory survey after the source has been exposed.

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

Signs alone do not provide an adequate means of access control. For industrial radiographic operations performed outside of a permanently established shielded facility, instructions requiring surveillance of the area to prevent unauthorized persons from entering the area are necessary. Direct surveillance is required to protect against unauthorized entry into a high radiation area except where the area is equipped with a control device or alarm system or

where the area is locked to protect against unauthorized or accidental entry (32 Ill. Adm. Code 350.3010). Under certain conditions, the Agency may require radiation activated warning lights in field operations.

For permanently established facilities, specific instructions concerning use of interlocking devices and systems, locking of the facility, security of keys, use of warning lights, etc. should be included in the procedures. The instructions for control of access to permanently established facilities should be separate and distinct from the instructions for temporary job site operations.

For industrial radiography in non-permanent facilities, instruct personnel to keep the perimeter of the restricted area under continuous surveillance. As previously noted, 32 Ill. Adm. Code 350.3045 requires, at a minimum, two-man crews (two industrial radiographers or an industrial radiographer and an industrial radiographer trainee) to ensure that surveillance is maintained at all times. Specify steps to take in the event that unauthorized personnel enter the restricted area (e.g., immediate termination of the industrial radiographic exposure). Surveillance of the perimeter of the restricted area will protect against entry into the high radiation area and prevent unnecessary exposure of individuals.

D. Methods and Occasions for Locking and Securing Industrial Radiographic Exposure Devices, Storage Containers and Sealed Sources

Locked industrial radiographic exposure devices and storage containers must be physically secured to prevent tampering or removal by unauthorized personnel. It is not acceptable to chain or secure a device containing a source to a fence or post. Unless an industrial radiographer or industrial radiographer trainee is physically present to maintain surveillance, a device containing a source should be placed in secure storage so that it is not accessible to unauthorized persons.

There may be situations in which industrial radiography is performed in 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 unrestricted area, and the facility should be posted with "Caution (or Danger) Radioactive Material" signs. A physical survey must be performed to confirm that the area around the storage facility is an unrestricted area.

Devices must be secured with the source 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 in accordance with 32 Ill. Adm. Code 350.1020. A radiation survey must be performed to confirm that the source is in the safe shielded position. As previously mentioned for crank-out devices, the survey must include the guide tube, collimators and the device itself in accordance with 32 Ill. Adm. Code 350.3030.

E. Personnel Monitoring and the Use of Individual Monitoring Devices

No individual may act as an industrial radiographer or industrial radiographer trainee unless, at all times during industrial radiographic operations, that person wears a direct-reading pocket dosimeter, a film badge or thermoluminescent dosimeter (TLD) and an alarm ratemeter. Details regarding the types of personnel monitoring devices used and their frequency of processing should be provided in Item 17 of the application.

Personnel must be instructed that they are required to charge their pocket dosimeters at the start of each workday and at the start of each work shift so that the dosimeters are capable of reading full scale (See 32 Ill. Adm. Code 350.2030). The dosimeter reading must be recorded at the beginning and end of each worker's shift.

The instructions must contain specific requirements for industrial radiography personnel to wear their personnel monitoring devices in a position that will accurately reflect the radiation exposure received.

Frequent reading of pocket dosimeters must be required so that personnel may monitor exposure. A procedure for action, to be taken immediately by radiography personnel in the event a dosimeter is found to be off-scale, must be established and implemented. This procedure must include provisions for immediate processing of film or TLD badges [See 32 Ill. Adm. Code 350.2030(c)(4)].

Instructions must include how and where dosimetry devices are to be stored when not in use. The storage place should be secure, dry, free of all radiation other than background and cool so that the devices will not be affected by adverse environmental conditions.

As previously noted, the Agency requires that each individual performing radiography at temporary job sites also wear an alarm ratemeter which is used and calibrated as specified in 32 Ill. Adm. Code 350.2030(e). Procedures for use and calibration of these devices should be submitted with your application. These procedures should include provisions for testing of alarming ratemeters at the start of each shift to ensure the alarm functions properly. The regulations do not require these devices at permanent industrial radiographic facilities (shooting cell).

F. Transporting Sealed Sources to Field Locations, Securing of Exposure Devices and Storage Containers in Vehicles, Placarding of Vehicles and Control of Sealed Sources During Transportation

The transport of licensed material must be carried out in accordance with the applicable requirements of the DOT Regulations, 49 CFR 170-189. Consult the 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 [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 (blocking and bracing);

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; and

4. Surveying the exterior surfaces and passenger compartment of the vehicle to ensure that the radiation levels do not exceed 0.516 μC/kg (2 mR) per hour from any exterior surface and 0.516 μC/kg (2 mR) per hour in the passenger compartment. Include instructions to personnel on the measures that should be taken if the radiation level exceeds these limits in the passenger compartment. For example, instruct personnel to add more shielding or to 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 a Radioactive Yellow III label were transported must be removed and "Caution - Radioactive Material" signs should be substituted. The radiation level may not exceed 0.516 μC/kg (2 mR) per hour from any external surface of the vehicle. The vehicle must be secured to prevent unauthorized access to radioactive material.

As noted in Item 10, the DOT requires that persons involved in the transportation of radioactive materials receive training pursuant to 49 CFR 172.

G. Methods or Procedures for Minimizing Exposure of Persons in the Event of an Accident -- Emergency Procedures

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

Limitations on actions which may be taken by radiography personnel should be clearly specified. The attempted recovery of a source that has become detached from an exposure device should not be attempted by radiography personnel without specific training or qualified help. 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 instructions and actual practice in retrieval operations with a dummy source. If you intend that industrial radiographic personnel perform source retrieval or recovery, include in your training program a description of the instruction they will receive, including practice with a dummy source. In addition, include specific instructions for source retrieval in your operating and emergency procedures.

The following instructions to personnel constitute the minimum acceptable emergency procedures:

1. Establish and post the restricted area at the 0.516 μC/kg (2 mR) per hour radiation level;

2. Maintain continuous surveillance of the restricted area until the situation is corrected; and

3. Notify or arrange for the immediate notification of the supervisor and the RSO.

In addition, describe the actions to be taken by management such as contacting the Agency and providing consultants/vendors for source retrieval and disposal.

H. 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. The Agency should be notified in accordance with 32 Ill. Adm. Code 350.3048, and the Agency's 24-hour emergency number, (217) 785-0600, should be included in the written emergency procedures.

I. Inspection and Maintenance of Radiography Exposure Devices, Source Changers, Storage Containers, Transport Containers, Source Guide Tubes, Crank-out Mechanisms and Devices

Industrial radiographic exposure devices, storage containers, and source changers must be checked for obvious defects prior to use each day the equipment is used in accordance with 32 Ill. Adm. Code 350.1080.

The instructions to personnel should 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. Area safeguards used during industrial radiographic operations in a shielded facility should also be tested for proper operation before each use. The area safeguards may include door or equipment interlocks, audible or visible warning or access door locking devices. Instructions for performance of such inspections should be in the procedures.

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 daily inspection should be made.

Quarterly inspections and preventive maintenance of equipment is also essential. If industrial radiography personnel are responsible for this activity, clear and specific instructions for inspection and maintenance should be contained in the procedures. As part

of the inspection and preventive maintenance program, all connectors, drive cables, source guide tubes, on-off indicator mechanisms, and other moving parts should be checked for defects and excessive wear. Cables should be cleaned and lubricated and all defective and excessively worn components repaired or replaced. Cables and drive mechanisms must also be checked for the presence of radioactive contamination which may result from wear of the camera's S-tube or damage to source capsule. If components essential to the safe operation of the device are found to be defective, the device should be labeled as defective and immediately removed from service until repairs have been made. Your instructions should indicate who will perform repairs to equipment. If repairs are to be performed by anyone other than the manufacturer. The qualifications of this individual and procedures to be followed for repairs must be specified. 32 Ill. Adm. Code 350.Appendix B provides a list of components for inspection for industrial radiographic devices. Your instructions should be tailored to your program and to the devices you wish to possess and use.

J. Maintenance of Records

1. Required Records

When you are granted a license, you must generate and maintain certain records. Among these are records generated by industrial radiography personnel during the performance of industrial radiography as well as records generated at permanent storage facilities at routine intervals, including:

a. Utilization logs. The instructions to personnel should clearly specify the need for the utilization log. The elements required are:

1. A unique identifying number or code (e.g., serial number) for each exposure device;

2. Name of the industrial radiographer using the exposure device; and

3. Locations where used and the dates each source of radiation is removed from storage and returned to storage.

b. Daily inspection of equipment. Instructions to personnel should specify that a record be made of the daily inspection. This must include the daily test of entrance control devices/alarm systems for permanent industrial radiographic installations.

c. Pocket dosimeter readings. These readings should be made at the beginning and end of a work shift. Instructions to personnel must specify that the readings be recorded.

d. Results of the physical surveys. These surveys must be performed as specified in Item 13.B above and include surveys after exposure to determine that the source has returned to the shielded position; surveys prior to securing an industrial radiographic exposure device or storage container; surveys for determination of the perimeter of the restricted area; surveys of vehicles used for

transporting sources and devices; surveys for determination of radiation levels at external surfaces of storage containers, including vehicles used for storage; surveys for determination that containers prepared for shipment comply with the requirements in U.S. Department of Transportation (DOT) regulations; and, surveys for determination that sources are in a shielded position following source exchange and that radiation levels around source changers meet regulatory requirements.

Instructions to personnel should specify that a record of these surveys be made in accordance with 32 Ill. Adm. Code 350.3030(i).

e. Records of tests for leakage and/or contamination;

f. Inventory of radioactive materials at three month intervals;

g. Training records;

h. Survey instrument/pocket ionization chamber/alarming ratemeter calibrations; and,

i. Internal audits.

There may be other operations performed by industrial radiography personnel for which records should be generated. These operations may include quarterly inspection and maintenance, instrument calibration, shipment of packages, daily checks of alarms for enclosed exposure systems, camera and storage area surveys, etc. If management requires industrial radiographers to perform operations including recordkeeping associated with the performance of industrial radiography, the instructions dealing with these operations should include training for maintaining the appropriate records for the operation.

Do not include instructions about records that are the responsibility of management and supervision. Most of these records must be maintained for a period of five years. For a complete listing of required records and intervals for maintaining records, see 32 Ill Adm. Code 350.Appendix C.

2. Records Available at Temporary Job Sites

Each licensee conducting industrial radiography at a temporary job site must ensure that the following records be made available at that site for inspection by the Agency in accordance with 32 Ill. Adm. Code 350.3040:

a. Illinois industrial radiographer certification card. Each industrial radiographer or industrial radiographer trainee shall have a card on his person at each job site;

b. Appropriate radioactive material license or certificate of registration or equivalent document;

c. Operating and emergency procedures;

d. Applicable regulations;

e. Survey records required pursuant to 32 Ill. Adm. Code 350.3030 for the period of operation at the site;

f. Daily pocket ionization chamber (i.e., pocket dosimeter) records for the period of operation at the site;

g. Daily alarm ratemeter records for the period of operation at the site; and

h. The latest instrument calibration and leak test records for specific devices in use at the site. Acceptable records include tags or labels which are affixed to the device or survey meter and decay charts showing leakage or contamination test results for sources that have been manufactured within the last six months.

Other topics which should be included in the operating and emergency procedures are:

A. Off-Scale Pocket Dosimeter Readings

An individual's film badge or TLD must be immediately sent for processing if the self-reading pocket dosimeter is found to be off scale. There are no exceptions to this requirement. In addition, the individual in question shall not use sources of radiation until the individual's radiation dose has been determined.

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 shielded position in the exposure device; and

2. Notify the individual specified in the emergency procedures.

In addition if a film badge or TLD is lost or damaged, the worker shall cease work immediately until a replacement is provided and the worker's dose is calculated for the time period from issuance of the loss/damage of the film badge or TLD.

B. Procedure for Identifying and Reporting Defects and Noncompliance

If industrial radiography personnel discover any malfunction or defect in industrial radiographic equipment, the device should be labeled, removed from service, and management notified so that it can take appropriate action. Instructions to personnel should require management notification if equipment malfunctions or defects are found.

C. Other Tasks

As indicated earlier in this guide, industrial 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 industrial radiography personnel are assigned such tasks, specific instructions for performance of the tasks should be included in the operating and emergency procedures.

Item 14 - Testing Sealed Sources for Leakage and/or Contamination

The testing of the sealed sources for leakage and\or contamination is required at intervals specified by 32 Ill. Adm. Code 340.410 and may be performed only by persons who are specifically authorized by the Agency to do so. In establishing a program for leak testing, you may choose one of three alternatives:

A. You may utilize the services of a consultant or commercial organization to take the necessary test samples, and report the results back to you;

B. You may be licensed by the Agency to use a commercially available leak test kit. Your application should: (1) specify the kit to be used; (2) indicate that the kit will be used in accordance with the instructions provided; and (3) identify the source or equipment to be tested with the kit. A copy of the leak test kit instructions should be submitted with your application; and

C. You may be licensed by the Agency to perform your own leak tests, including the taking and the evaluation of the wipes. The information as outlined in Appendix H should be submitted in support of your application.

When using a licensed service, you must maintain a copy of that company's license which authorizes them to perform tests for leakage and\or contamination as a service.

Item 15 - Internal Audit Program

In order to determine the applicant's ability to comply with 32 Ill. Adm. Code 350.2010(d), the applicant must submit a description of the internal audit program. This program must assure that the license conditions, Agency Regulations and operating and emergency procedures are followed by industrial radiographers and industrial radiographer trainees. These instructions should include a description of:

A. The qualifications of each person responsible for performing audits;

B. The type of internal inspections to be made and their frequency;

C. The responsibilities of each person in the program;

D. The procedure for recording and reporting deficiencies to appropriate management personnel; and

E. The education and follow-up program to be utilized in correcting deficiencies noted during audits.

Inspections of industrial radiographic operations should be made by a person of authority who is thoroughly familiar with industrial radiographic operations such as the RSO or a member of management. Such audits shall be made at intervals not to exceed 12 months or if an industrial radiographer has not performed industrial radiography operations within 6 months, the licensee shall audit that individuals performance at the next operation in which he is involved [32 Ill. Adm. Code 350.2010(d)]. This person should have a thorough knowledge of equipment, procedures, and regulations, and have demonstrated a level of competency equivalent to or above that expected of an industrial radiographer. In addition to these audits, management should implement a continuous review of quarterly inventories, utilization logs, records of receipt and disposal of licensed material, personnel monitoring results and surveys.

Exhibit D, Internal Audit Checklist, provides an example of an internal audit checklist. Your internal audit checklist should be tailored to your program.

Item 16 - Waste Disposal or Transfer

Describe specific methods used for disposal or transfer of radioactive material, including the facilities and procedures for storing the waste prior to disposal or transfer. A licensee may transfer radioactive material to another licensee provided that license verification is obtained which ensures that they are authorized to receive the radioactive material. The licensee may dispose of waste by transfer to a person properly licensed to receive such waste [e.g., commercial waste disposal firms (See 32 Ill. Adm. Code 330.400)].

No licensee may dispose of radioactive material waste by burial in soil or by incineration unless specifically authorized by the Agency (See 32 Ill. Adm. Code 340.1010, 340.1020 and 340.1040).

Exhibit E contains a form which may be used to supply the information requested in this item.

Item 17 - Personnel Monitoring

32 Ill. Adm. Code 350.2030 specifies what personnel monitoring equipment is necessary. On the application, indicate the type(s) of personnel monitoring device(s) to be used (e.g., whole-body and/or finger device) and the frequency at which the device will be exchanged and evaluated. In addition to whole-body film or thermoluminescent dosimeter (TLD) badges, personnel must wear a direct reading pocket ionization chamber and an alarm ratemeter. Each applicant using a film badge or TLD service must also ensure that the service meets the requirements of 32 Ill. Adm. Code 340.510(c).

For direct reading dosimeters (pocket ionization chambers) and alarm ratemeters used in the program, you should indicate the conditions under which they will be used, each dosimeter's useful range, frequency of reading and recording dosimeter readings (except alarm ratemeters), and the procedure for maintaining and calibrating the dosimeters. Please note, however, that direct reading dosimeters are not an acceptable means of primary dose assessment when personnel monitoring is required by 32 Ill. Adm. Code 340.520. Such required monitoring must be accomplished by film badges or TLD badges.

Appendix I contains a sample procedure for use and calibration of direct reading dosimeters. If direct reading dosimeters are used, either indicate that the procedure contained in Appendix I will

be followed or submit an alternate procedure for Agency review. Again, industrial radiography personnel must now also wear an alarm ratemeter as per 32 Ill. Adm. Code 350.2030(e). Use and calibration of this device must also be specified.

Item 18 - License Fees

Refer to 32 Ill. Adm. Code 331 and the appropriate fee schedule to determine the correct fee. Applications will NOT be processed until the correct fee is received by this Agency. Questions concerning fees should be directed to the Radioactive Materials Section Licensing Section staff.

Item 19 – Financial Assurance

(((THIS SECTION NEEDS TO BE COMPLETED)))

Item 20 - Certification

The application must be signed and dated by the applicant, if acting as an individual, or by an individual who is authorized by management to sign on behalf of the facility. A statement signed by facility management granting authority to sign license requests and related documents is required for applications not signed by an officer or the administrator of the facility. Unsigned applications will be returned for proper signature.

IV. LICENSE AMENDMENTS

Licensees are required to conduct their programs in accordance with the regulations and statements, representations, and procedures contained in the license application and supporting documents. The license must be amended if the licensee plans to make any changes in the facilities, equipment, procedures, authorized users, RSO, or radioactive material used.

Applications for license amendments should be filed on the "Application Form for Radioactive Material License for Industrial Radiography", or in letter form. The application must identify the license by number and clearly describe the exact nature of the changes, additions, or deletions requested. References to previously submitted information and documents must be clear and specific and identify the applicable information by date, page, and paragraph. This documentation must also be maintained on file for inspection. An original and two copies of the application for amendment should be prepared. The original and one copy must be submitted, and the licensee must retain one copy and all attachments with the license file. Licensees must conduct their program in accordance with their current license until said amendment is issued.

V. LICENSE RENEWAL

An application for license renewal must be received by the Agency at least 30 days prior to the expiration date. This filing will ensure that the license does not expire until final action on the application has been taken by the Agency as provided for by 32 Ill. Adm. Code 330.330.

Renewal applications must be filed on the "Application Form for Radioactive Material License

for Industrial Radiography", appropriately supplemented, contain complete and up-to-date information about the applicant's program, and meet all licensing and regulatory requirements in effect at the time of renewal. Renewal applications should be submitted without reference to documentation and information submitted previously, except for previously approved users. If such references cannot be avoided, they are acceptable provided:

A. The reference is made in response to a particular item of required information (e.g., radiation instrument calibration procedures);

B. The reference is clear and specific (e.g., title of document, date of submission, page, and paragraph); and

C. The referenced document contains all information required for a particular item at the time of renewal.

Renewal applications should be submitted in accordance with the procedures outlined in Section II (Filing an Application) of these instructions.

VI. LICENSE TERMINATIONS

A licensee may request termination of a radioactive material license at any time. To terminate a license, the licensee must meet the requirements of 32 Ill. Adm. Code 330.320(d), which include:

A. Transfer or disposal of all licensed radioactive material in the licensee's possession in accordance with 32 Ill. Adm. Code 340;

B. Completion of IEMA form KLM.007, "Certificate - Termination and Disposition of Radioactive Material" (see Exhibit E); and

C. Performance of radiation surveys or the equivalent in accordance with 32 Ill. Adm. Code 330.320(d)(1)(E).

Submit the completed IEMA Form KLM.007 and a copy of any applicable radiation surveys to the Agency at least 30 days before the expiration date of the license or upon termination of all licensed activities. The Agency reserves the right to perform confirmatory surveys of licensed facilities prior to termination.

APPENDIX A

GUIDE TO SI UNITS

RADIATION DOSE EQUIVALENT		AMOUNT OF RADIOACTIVE MATERIAL		SURFACE ACTIVITY LEVELS		
OLD *(rem)*	NEW *(sievert)*	OLD Ci *(curie)*	NEW Bq *(becquerel)*	$\mu Ci/cm^2$	Bq/cm^2	(kBq/m^2)
0.1 mrem	1 µSv	1 pCi	37 mBq	10^{-6}	0.037	0.37
0.25	2.5					
0.5	5					
0.75	7.5	27 pCi	1 Bq	3×10^{-6}	0.1	0.1
1.0 mrem	10 µSv					
2.5	25	1 nCi	37 Bq	10^{-5}	0.37	3.7
10 mrem	100 µSv (0.1 mSv)	27 nCi	1 kBq	3×10^{-5}	1	10
100 mrem	1 mSv	1 µCi	37 kBq	10^{-4}	3.7	37
500 mrem	5 mSv	27 µCi	1 MBq	3×10^{-4}	10	100
1 rem	10 mSv	1 mCi	37 MBq	10^{-3}	37	370
1.5 rem	15 mSv					
5	50	27 mCi	1 GBq	3×10^{-3}	100	1000
10 rem	100 mSv	1 Ci	37 GBq	10^{-2}	370	3700
15 rem	150 mSv					
50 rem	500 mSv	27 Ci	1 TBq		$(1\ m^2 = 10^4\ cm^2)$	
100 rem	1 Sv					

CONVERSIONS	RADIATION DOSE RATES	DERIVED AIR CONCENTRATION (DAC)	CONCENTRATION IN SOLUTION	
100 rem = 1 Sv		Units: $Bq\ m^{-3}$	µCi	kBq/dm^3 (kBq/l)
100 rad = 1 Gy (gray)	µSv/h, mSv/h		1	37
1 ton = 1 Mg	e.g.,	Conversion:	10	370
1 ton = 1000 kg	7.5 µSv/h	$\mu Ci\ cm^{-3} \times 3.7 \times 10^{10} = Bq\ m^{-3}$	100	3700
1 kg = 1000 g	25 µSv/h	$\frac{dpm\ m^{-3}}{60} = Bq\ m^{-3}$	$1\ m^3 = 10^3\ dm^3 = 10^3$ l or 10^3 L	
1 MBq/ton = 1 Bq/g			$1\ mBq/m^3 = 1\ kBq/dm^3$	

PREFIXES FOR UNITS:

a	atto	10^{-18}		k	kilo	10^3	thousand
f	femto	10^{-15}		M	mega	10^6	million
p	pico	10^{-12}	trillionth	G	giga	10^9	billion
n	nano	10^{-9}	billionth	T	tera	10^{12}	trillion
µ	micro	10^{-6}	millionth	P	peta	10^{15}	
m	milli	10^{-3}	thousandth	E	exa	10^{18}	

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APPENDIX B

SAMPLE MINIMUM DETECTABLE ACTIVITY CALCULATIONS

Several references contain discussions of counting statistics for radiation measurements. For purposes of this guide, the discussion contained in NCRP Report No. 58 appears to be the simplest to use. The formula the Agency recommends is the one for determining a measurement at the 95% confidence level. The formula for this level is:

$$LLD = \frac{2.71 + 4.65\sqrt{B}}{EFF}$$

where:

LLD = Lower Limit of Detection (dpm, divide by 2.2 E+6 for µCi)
B = Background counting rate (counts/time) and
EFF = Counting efficiency.

The sample counting time and background counting time must be equal. The counting efficiency must be determined by using a standard source of known activity that emits photons of approximately the same energy as the contaminant to be detected. The counting rate for the standard is divided by the standard activity to determine the counting efficiency. When dividing, the two values must be in compatible units. For example, a standard activity in µCi must be converted to dpm by multiplying by a factor of 2.2 E+6.

For a copy of the full discussion of the theory and limitations of this test, refer to pages 307-311 in NCRP Report No. 58, A Handbook of Radioactivity Measurement Procedures, issued February 1, 1985 by the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814.

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APPENDIX C

METHOD FOR CALIBRATING RADIATION SURVEY INSTRUMENTS

1. Application For a Licensee to Perform Radiation Survey Instrument Calibrations

When radioactive material is used to calibrate radiation survey instruments, the person or organization performing the calibration must be specifically authorized by the Agency, the U.S. Nuclear Regulatory Commission, an Agreement State, or a Licensing State.

An application for a licensee to perform radiation survey instrument calibrations should contain the following information:

a. The manufacturer's name and model of the source(s) to be used.

b. The radionuclide and activity of the radioactive material contained in the source(s).

c. The accuracy of the source(s) activity; documentation that the determination of each source activity is traceable to the National Institute of Standards and Technology - NIST (previously National Bureau of Standards - NBS) or other national standard.

d. A description of the facilities to be used.

e. The name and applicable experience of each individual who will perform the calibrations.

f. Calculations related to the calibration procedures.

g. The step-by-step calibration procedures, including associated radiation safety procedures.

h. Copies of records that will be maintained (see Item 4).

i. Verification that the requirements outlined in this appendix will be followed.

2. Recommended Methods For Calibration of Radiation Survey Instruments

The calibration of radiation survey instruments shall be performed in accordance with the following:

a. The radionuclide sources used for calibration shall approximate point sources.

b. The source activities shall be traceable* within ±5% accuracy to the NIST (previously NBS) calibrations.**

c. The frequency of calibration shall be at intervals not to exceed 6 months and after servicing/repair.

d. Each scale of the radiation survey instrument shall be calibrated at least at two points such that: (a) one point is in each half of the scale; and (b) the two points are separated by 50-60% of full scale. Logarithmic and digital readout radiation survey instruments with only a single readout scale shall be calibrated, at a minimum, at one point near the midpoint of each decade.

e. The exposure rate measured by the radiation survey instrument should not deviate more than ±20% from the calculated or known value for each point checked. (Read appropriate section of the radiation survey instrument manual to determine how to make necessary adjustments to bring the radiation survey instrument into calibration.) If the radiation survey instrument cannot be adjusted so that each reading falls within the ±20% range, it shall be taken out of service and sent to the manufacturer or to a qualified radiation survey instrument laboratory for repair.

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* For purposes of this document, the amount of radioactivity in a source is said to be traceable to a national standard when its radioactivity was determined by comparison with a source of the same radionuclide (or a proper simulated source, isotopically) the activity of which is certified by the NIST.

** In lieu of using a traceable radioactive source, a transfer instrument traceable to the NIST, within ±5%, may be used as an alternative standard. For purposes of this document, a transfer instrument shall meet the definition as contained in the American National Standard Institute publication, ANSI N323-1978, "Radiation Protection Instrumentation Test and Calibration."

NOTE: Sources of cobalt-60, cesium-137, or radium-226 are appropriate for use in calibrations. The radioactivity of the calibration standard should be sufficient to calibrate the radiation survey instruments on all ranges, or at least up to 258 μC/kg (1 Roentgen per hour) on the higher range radiation measurement instruments. If there are higher ranges, they should be checked for operation and approximately correct response to radiation.

f. If an electronic device is used to calibrate instruments, the instrument must still be checked for response to a known source of radiation.

3. Use of a Reference Check Source for Operational Checks

A reference check source (or the gamma camera in a locked and shielded position) shall be used to obtain a radiation survey instrument response by the licensee. The reading shall be taken with the check source placed in a specific geometry relative to the detector and:

a. Shall be taken before use on each day the instrument is used;

b. Shall be taken after calibration by the licensee or after return to the licensee of a radiation survey instrument sent for calibration by a specifically licensed firm authorized to perform radiation survey instrument calibrations as a customer service;

c. Shall be taken after maintenance and/or each battery change; and

If any radiation survey instrument does not respond appropriately to the check source, the radiation survey instrument shall be removed from service and recalibrated.

4. Records

Records for Items 2, 3.b and 3.c, of this procedure shall be maintained.

a. Records for Item 2 shall include, at a minimum:

1) Radionuclide used;
2) Activity and assay date of source;
3) Present activity;
4) Calculated and measured radiation values, including the percent of difference;
5) Respective distance from source for each calculated and measured radiation value;
6) Make, model and serial number of radiation survey instrument being calibrated;
7) Name of individual performing the calibration; and
8) Date radiation survey instrument calibration was performed.

b. Records for Items 3.b and 3.c, of this procedure shall include, at a minimum:

1) Radionuclide used;
2) Activity and assay date of the radionuclide used;
3) Date of calibration;
4) Make, model and serial number of the radiation survey instrument;
5) Date reference check was performed; and

6) Name of individual who performed the reference check.

5. Use of Inverse Square Law and Radioactive Decay Law

a. A calibrated source will have a calibration certificate giving its output at a given distance measured on a specific date by the manufacturer or National Institute of Standards and Technology (NIST).

1) The Inverse Square Law may be used with any point source to calculate the exposure rate at other distances.

2) The Radioactive Decay Law may be used to calculate the output at other times after the specified date.

b. INVERSE SQUARE LAW:

S (R_1) (R_2)

* - - - - -P_1

* - - - - - - - - -P_2

Exposure rate at P_2:

$$R_2 = \frac{(P_1)^2 \times (R_1)}{(P_2)^2}$$

where:

S is the point source

R_1 and R_2 are the exposure rates at P_1 and P_2 in the same units (e.g., mR/hr or R/hr).

P_1 and P_2 are the distances from the point source in the same units (centimeters, meters, feet, etc.)

c. RADIOACTIVE DECAY LAW:

$$R_t = R_o\, e^{-(0.693\, t / T_{1/2})}$$

where:

R_o and R_t are in the same units (e.g., mR/hr or R/hr)

R_o is exposure rate on specified calibration date (initial time)

R_t is exposure rate "t" units of time later

$T_{1/2}$ and t are in the same units (years, months, days, etc.)

$T_{1/2}$ is half-life of the radionuclide

t is the time elapsed between the source calibration (assay) date and the radiation survey instrument calibration date (present time)

d. Example: Source output is given by calibration certificate as 100 mR/hr at 1 foot on March 10, 1985. Radionuclide half-life is 5.27 years.

Question: What is the output at 3 feet on March 10, 1987 (2.0 years later)?

1) Output at 1 foot, 2.0 years after calibration date:

$$R_{(1\ ft)} = 100\ mR/hr\ [\exp^{-((0.693 \times 2.0)/5.27)}]$$

$$= 100\ mR/hr\ (0.77)$$

$$= 77\ mR/hr \text{ at 1 foot on March 10, 1987}$$

2) Output at 3 feet, 2.0 years after calibration date:

$$R_{(3\ feet)} = \frac{(1\ foot)^2}{(3\ feet)^2}\ (77\ mR/hr)$$

$$= 1/9\ (77\ mR/hr)$$

$$= 8.6\ mR/hr \text{ at 3 feet on March 10, 1987}$$

APPENDIX D

Sample Facility Diagram

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APPENDIX E

Radiation Safety Training and Experience

General Information

The applicant must provide an adequate training program for industrial radiographers and industrial radiographer trainees in accordance with 32 Ill. Adm. Code 350.2010, 350.4010(c)(1), 405.70(405.Appendix A) and 405.80. If training programs other than the applicant's are used, details of such training must be included as part of the application and not just referenced in the application. In addition to the items specified in Item 10, a description of the training program should include the following items:

Industrial Radiographer Trainee

For an individual without previous training and experience to be designated as an industrial radiographer trainee, the following should be provided:

A. Approximately 40 hours of classroom instruction in the topics listed in 405.App.A.

B. Instruction in the use of industrial radiographic equipment.

The instruction in the use of equipment should be sufficient to enable the individual to pass a supervised practical exam including operation of the equipment in the presence of an industrial radiographer while actually performing industrial radiography.

Before an individual may be designated as an industrial radiographer trainee, the individual should be tested to determine his or her understanding of your operating and emergency procedures and the use of equipment. An examination of approximately 50 questions should be given. Design the examination to test the individual's understanding of your operating and emergency procedures and the use of equipment.

Industrial Radiographer

For an individual to be designated as an industrial radiographer, the individual should have the following training and experience:

A. Approximately 40 hours of classroom instruction in the topics listed in 405.App.A.

B. A minimum of 200 hours of on-the-job training as an industrial radiographer's trainee for use of radioactive material.

Instruction in the radiation safety matters listed in 405.App.A may be provided by a consultant authorized to provide industrial radiography training or may be conducted "in house."

A comprehensive written examination of approximately 50 questions should be given to determine the individual's understanding of all the topics in the industrial radiographer's formal training. The examination should deal with the subject matter listed in 32 Ill. Adm. Code 405.App.A and should not include questions related to methods of obtaining quality radiographs but rather questions related to

radiation safety. A field examination should be given at the end of on-the-job training to determine that the individual is competent to perform all assigned operations.

For an individual who has been an industrial radiographer for another licensee, it is your responsibility to determine the individual's competence to act as an industrial radiographer for you. As a minimum, the individual should receive formal instruction similar to that given to prospective industrial radiographer trainees; that is, instruction in your operating and emergency procedures and in the use of your equipment. Also, the individual should be given the written and field examinations for designation as an industrial radiographer.

The person who instructs individuals in the principles of radiation and radiation safety should have knowledge and understanding of the principles beyond that obtainable in a course similar to the one given to prospective industrial radiographers. Individuals who provide instruction in the use of equipment should be certified industrial radiographers with at least 2 years of experience in performing industrial radiography.

Periodic training should be conducted at least annually. The periodic training should provide a review of radiation safety principles, regulations, your procedures, and your company policies with respect to radiation safety practices and a discussion of any new regulations or requirements.

With respect to industrial radiography personnel, the following important points apply:

1. Industrial radiography personnel must meet the requirements of 32 Ill. Adm. Code 350.2010(a) and 405.App.A.

2. Industrial radiography personnel must meet the certification requirements of 32 Ill. Adm. Code 405.90.

3. The duties and responsibilities of the industrial radiographer may not be delegated to an industrial radiographer trainee.

4. An industrial radiographer must be physically present at the location where industrial radiography is being performed in accordance with 32 Ill. Adm. Code 350.2040 of the Regulations. When industrial radiography is performed at a location other than a permanent industrial radiographic installation, a minimum of two industrial radiographic personnel shall be present to operate the exposure device (i.e., two industrial radiographers or an industrial radiographer and an industrial radiographer trainee).

5. An industrial radiographer trainee may not independently perform any source manipulation, survey, etc. unless an industrial radiographer is physically present.

6. Any individual who assists an industrial radiographer by manipulation of industrial radiographic exposure devices, sealed sources, related handling tools, or survey instruments is acting in the capacity of an industrial radiographer trainee and must meet the requirements of 32 Ill. Adm. Code 350.2010(b).

APPENDIX F

SAMPLE PROCEDURES FOR ORDERING AND RECEIVING RADIOACTIVE MATERIAL

1. An individual authorized by management must place all orders for radioactive material and must ensure that the requested materials and quantities are authorized by this license and that possession limits are not exceeded.

2. During normal working hours, carriers must be instructed to deliver radioactive packages directly to the radioactive material use or storage area.

3. During off-duty hours, security personnel must accept delivery of radioactive packages in accordance with the procedures outlined in the sample memorandum below:

SAMPLE MEMORANDUM

MEMORANDUM FOR: Security Personnel

FROM: John Jones, Administrator

SUBJECT: RECEIPT OF PACKAGES CONTAINING RADIOACTIVE MATERIAL

If the package is wet or appears to be damaged, immediately contact the hospital's RSO. Ask the carrier to remain at the hospital until it can be determined that neither the carrier nor the vehicle is contaminated.

Any packages containing radioactive material that arrive between 4:30 P.M. and 7:00 A.M. or on Sundays shall be signed for by the Security guard on duty or other designated trained personnel and taken immediately to the Nuclear Medicine Agency. Unlock the door, place the package in the hot lab (or designated secured area) and relock the door.

RADIATION SAFETY OFFICER (RSO):_____

OFFICE PHONE:_____

HOME PHONE:_____

ILLINOIS EMERGENCY MANAGEMENT AGENCY 24-HOUR PHONE: (217) 785-0600

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APPENDIX G

PROCEDURE FOR SAFELY OPENING RADIOACTIVE MATERIAL PACKAGES

For packages received under the specific license, the following procedure for opening each package will be performed in a restricted area as soon as practicable after receipt, but no later than 3 hours after the package is received at the licensee's facility if it is received during the licensee's normal working hours or if there is evidence of degradation of package integrity, such as a package that is crushed, wet or damaged. If a package is received after working hours, and has no evidence of degradation of package integrity, the package shall be monitored no later than 3 hours from the beginning of the next working day.

A. Visually inspect package for any sign of damage (e.g., wetness, crushed). If damage is noted, stop procedure and notify the Radiation Safety Officer.

B. Measure exposure rate at 1 meter from package surface and record. If greater than 2.58 μC/kg/hr (10 mR/hr), stop procedure and notify the Radiation Safety Officer.

C. Measure surface exposure rate and record. If greater than 52.6 μC/kg/hr (200 mR/hr), stop procedure and notify the Radiation Safety Officer.

D. Open the package (following manufacturer's directions, if supplied) and remove packing slip. Verify contents (compare requisition, packing slip, and label on container) and check integrity of final source container. Check also that shipment does not exceed possession limits.

E. Survey radiographic exposure devices, source changers and transport containers to ensure that they meet the limits for radiation levels specified in 32 Ill. Adm. Code 350.1010.

F. If contamination of package is suspected, wipe test the package and notify the Radiation Safety Officer.

G. Maintain records of receipt and package survey.

H. The final carrier and the Agency shall be immediately notified by telephone and shall confirm the initial contact within 24 hours by overnight letter or telefacsimile to the Agency, when:

   1. Removable radioactive surface contamination exceeds the limits of 32 Ill. Adm. Code 341.150(h); or

   2. External radiation levels exceed the limits of 32 Ill. Adm. Code 341.150(i) and (j).

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APPENDIX H

TESTING SEALED SOURCES FOR LEAKAGE AND/OR CONTAMINATION

Applicants who wish to perform their own tests for leakage and/or contamination (leak/wipe tests), including the procurement and the analysis of the test samples, must submit the following descriptive information in support of the application:

1. Describe all instrumentation which will be used for the analysis of the test samples. The descriptive information should include:

   a. The manufacturer, model and serial number of each instrument;

   b. The types and energies of detectable radiation, as applicable to each instrument;

   c. The efficiency of each instrument, for each type of radioactive material to be tested, including the supportive calculations documenting such efficiency; and

   d. The minimum sensitivity of each instrument, for each type of radioactive material to be tested, including the supportive calculations documenting such minimum sensitivity. At a minimum, the instrument used must be capable of detecting 185 Bq (0.005 μCi) of the radioactive material being tested.

2. Identify the calibration standards to be used in the analysis of each radioactive material to be tested. The identification shall include the manufacturer, model, radionuclide and activity of each standard. Such standards shall be traceable to a national standard.

3. Describe the calibration procedures and the frequency of calibration for each instrument.

4. Describe the material or leak/wipe test kit to be used in collecting the leak/wipe test samples.

5. Describe in detail the procedure for performing the analysis of the leak/wipe test samples.

6. Submit sample calculations showing the conversion of the raw counting data to units of becquerels (Bq) or microcuries (μCi) .

7. Describe the method for disposing of contaminated leak/wipe test samples.

8. Describe the training and experience of each person who will analyze and evaluate the results of the leak/wipe test samples.

9. Describe the records to be maintained for each leak/wipe test. These shall include:

   a. The location of the source which was leak/wipe tested;

   b. The date the sample was collected;

   c. The individual collecting the sample;

d. The person performing the analysis;

e. The date the analysis was performed;

f. The unique identification of the source tested; e.g., manufacturer, model, serial number, etc.

g. The radionuclide and the activity of radioactive material contained in the source; and

h. The results of the test expressed in units of becquerels (Bq) or microcuries (μCi). Actual test results shall be reported unless such results are less than 185 Bq (0.005 μCi).

APPENDIX I

DIRECT READING DOSIMETER USE AND CALIBRATION

USE OF DIRECT READING DOSIMETERS

1. Each direct reading dosimeter (dosimeter) used must have been calibrated within one year prior to its use.

2. Only one person shall be assigned a single dosimeter at any one time.

3. A log must be made to document the measured exposures of each individual using a dosimeter. This log shall record the date and time of each entry and the name and social security number of the monitored individual.

4. At the beginning of each shift, or prior to entering an area where dosimeters are needed, the dosimeter must be zeroed (charged) to indicate essentially no exposure. If this is not practicable, document the initial exposure reading in the dosimeter log.

5. Enter the exposure reading from the dosimeter in the dosimeter log daily (immediately before the end of a shift, or after all entries into a restricted area have been performed).

6. The Radiation Safety Officer must be notified immediately if a dosimeter is discharged beyond its range.

7. At least once each month, total the exposures in the log for each individual who used a dosimeter during that period. These totals may be kept in the log or with other dosimetry results maintained by the licensee.

CALIBRATION OF DIRECT READING DOSIMETERS

1. The calibration of a direct reading dosimeter (dosimeter) shall be performed in accordance with the following:

    a. The radionuclide sources used for calibration shall be approximate point sources.

    b. The source activities shall be traceable within 5% accuracy to NIST.

    c. The dosimeter shall be calibrated at two scale readings, separated by at least 50 percent of the full-scale reading.

    d. The exposure measured by the dosimeter shall not differ from the calculated (true) exposure by more than $\pm$ 20 percent of the calculated (true) value.

    e. Dosimeters shall be charged, placed in a radiation-free environment (excluding background radiation), then read after a minimum of 24 hours has passed. A dosimeter shall be considered defective if the rate of leakage (drift) is greater than 5 percent of the

dosimeter full-scale reading.

2. Records of calibration shall include:

   a. Radionuclide used,

   b. Activity and activity assay date of source,

   c. Date of dosimeter calibration,

   d. Activity of source at date of dosimeter calibration,

   e. Calculated (true) and measured radiation values,

   f. Respective distance from source for each calculated and measured radiation value,

   g. Elapsed time of exposure for each measured radiation value,

   h. Necessary scale correction factors (required if calculated and measured radiation values do not agree within $\pm$ 20 percent),

   i. Make, model, and serial number of dosimeter calibrated, and

   j. Signature of individual who performed the calibration.

ILLINOIS EMERGENCY MANAGEMENT AGENCY

1035 OUTER PARK DRIVE
SPRINGFIELD, ILLINOIS 62704

APPLICATION FORM FOR RADIOACTIVE MATERIAL LICENSE FOR INDUSTRIAL RADIOGRAPHY

Complete all items if this is an initial application for renewal of a license. Use supplementary sheets where necessary. Retain one copy and submit the original and one copy of the entire application to the Illinois Emergency Management Agency.

This state agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under 32 Ill. Adm. Code 330. Disclosure of this information is required. Failure to provide any information may result in denial of a radioactive material license. This form has been approved by the State Forms Management Center.

ITEM 1. Type of application (Check one)

☐ NEW LICENSE ☐ RENEWAL ☐ AMENDMENT Radioactive Material License #_____

ITEM 2. Applicant's Name and Mailing Address (Applicant must be the legal entity or individual responsible for the license.)	**ITEM 3. Person to Contact Regarding This Application:**
Phone #:	Phone #:
Fax #:	Fax #:
E-mail:	E-mail:

ITEM 4. Address(es) Where Radioactive Material Will Be Used ☐ **Stored** ☐ **Used and Stored** ☐

Phone #:	Phone #:

Request for TEMPORARY JOB SITES (≤ 180 days during any consecutive twelve-month period): Yes ☐ No ☐

ITEM 5. Radiation Safety Officer (RSO)

Name: _____

☐ (Attach Evidence of Training and Experience)

ITEM 6. Radioactive Material

Element and Mass Number		
Chemical and Physical Form	Sealed Source	Sealed Source
Source Manufacturer and Model		
Maximum Activity per Source		
Number of Sources Requested		
Device Manufacturer and Model		
Intended Use		

ITEM 7. Instrumentation (Check one)

☐ Completed Exhibit B from Instructional Set 87.0 dated September 1996 or equivalent is attached.

ITEM 8. Instrument Calibration and Operability Checks (Check one)

☐ Radiation survey instruments will be calibrated by a service company authorized to perform such services. We will maintain a copy of the company's license authorizing such services.

☐ We will calibrate radiation survey instruments in accordance with the attached procedures, which contain all information requested in Appendix C of Instructional Set 87.0 dated September 1996.

ITEM 9. Facilities and Equipment

☐ Diagrams of radioactive material use and storage area are attached.

ITEM 10. Personnel Training Program

☐ Description of training program, including frequency, form and duration is attached.

ITEM 11. Procedure for Ordering and Receiving Radioactive Material

☐ Procedure for ordering and receiving radioactive material is attached.

ITEM 12. Procedure for Safely Opening Radioactive Material Packages (Check one)

☐ We will use the procedure identified in Appendix G of Instructional Set 87.0 dated September 1996.

☐ Procedure is attached.

ITEM 13. Operating and Emergency Procedures

☐ Procedure is attached.

ITEM 14. Testing Sealed Sources for Leakage and/or Contamination (Check one)

☐ We will use a commercial service to perform analysis of leakage and/or contamination samples. We will maintain a copy of the commercial service's license authorizing such services.

☐ We will perform our own analysis of source leakage and/or contamination. Procedure is attached.

ITEM 15. Internal Audit Program (Check one)

☐ Procedure is attached.

ITEM 16. Waste Disposal (Check one)

☐ We will use the manufacturer or other commercial service for disposal or transfer of our selaed sources. We will maintain a copy of the commercial services license authorizing such services.

☐ Alternate disposal methods are detailed in an attachment to this application.

ITEM 17. Personnel Monitoring (Check all that apply)

TYPE	LOCATION		EXCHANGE FREQUENCY	
☐ Film	☐ Whole body	☐ Extremity	☐ Monthly	
☐ TLD	☐ Whole body	☐ Extremity	☐ Monthly	☐ Quarterly
☐ OSL	☐ Whole body	☐ Extremity	☐ Monthly	☐ Quarterly

☐ Direct reading dosimeters will be used and calibrated in accordance with Appendix I of Instructional Set 87.0 dated September 1996.

☐ Direct reading dosimeter use and calibration procedure is attached.

☐ Alarming Ratemeter use and calibration procedure is attached.

ITEM 18. License Fees (Refer to 32 Ill. Adm. Code 331)

Please do not submit your fee payment. New applicants will be billed a prorated fee for the portion of the billing year remaining from the date the application is received. Licensees adding sites or changing fee categories will be billed when the license is amended. Existing licensees and applicants are also subject to annual bills as specified in 32 Ill. Adm. Code 331.

Fee Category_____

ITEM 19. Financial Assurance

The applicant must satisfy applicable financial assurance requirements as described in 32 Ill. Adm. Code 326.

NEW APPLICANT (Check one)

☐ Exempt ☐ $25,000 arrangement will be provided at a later date ☐ Reclamation plan/cost estimate attached

RENEWAL OR AMENDMENT (Check one)

☐ Exempt ☐ Existing document reviewed – no changes necessary ☐ Limiting condition applies
☐ Updated reclamation plan/cost estimate attached

ITEM 20. Certification

EACH APPLICANT MUST COMPLETE SECTION A:

A. I have reviewed the above items and hereby certify that my radiation protection program meets the current 32 Ill. Adm. Code, radioactive materials license with active amendments, operating procedures and ALARA Program, and that all information contained herein, including any supplements attached hereto, is true and correct to the best of my knowledge and belief.

SIGNATURE:_____ DATE:_____

NAME:_____ TITLE:_____
(Print or Type)

COMPLETE THIS SECTION IF THE APPLICANT IS AN INDIVIDUAL:

B. If you are applying as an individual, rather than as a corporation or other legal entity, you must provide the following information in order to process your application:

Have you defaulted on an educational loan guaranteed by the Illinois Student Assistance Commission? Yes ☐ No ☐

I certify, under penalty of perjury, that I am not more than 30 days delinquent in complying with a child support order. Failure to certify may result in a denial of the license and making a false statement may subject you to contempt of court. (5 ILCS 100/10-65)

I declare that all information either included with or appearing on this application is accurate and true to the best of my knowledge.

SIGNATURE:_____ DATE:_____

APPLICANT'S SOCIAL SECURITY NUMBER:_____

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EXHIBIT B

INSTRUMENTATION FORM

1. Portable Radiation Detection Instruments
(0.516 μC/kg to 258 μC/kg or 2 mR/hr to 1 R/hr)

Manufacturer:_____

Model:_____

Available:_____

Range:_____

Window Thickness:_____
(mg/cm^2)

Detector Type:_____
(G-M, Ion Chamber, etc.)

2. Pocket Ionization Chamber/Alarm Ratemeter

Manufacturer:_____

Model:_____

Available:_____

Range:_____

Alarm set point:_____

3. Fixed Area Monitor

Manufacturer:_____

Model: _____

Available: _____

Range:_____

4. Instrument Used for Analysis of Wipe Test*)

Manufacturer:_____

Model: _____

*Minimum Detectable Activity: _____

5. Other Instruments (Continue on separate sheet if necessary.)

(Generic Description)_____

Manufacturer:_____

Model: _____

Range: _____

* Submit calculations as described in Appendix B.

EXHIBIT C

(((INSERT FORM PAGE 1 HERE)))

(((INSERT FORM PAGE 2 HERE)))

EXHIBIT D

Internal Audit Checklist

Industrial Radiographic Location_____ Date_____ Time_____

Industrial Radiographer_____ Inspector_____

Radionuclide_____ Curies_____ Serial No._____

Industrial Radiographic Exposure Device Serial No._____

Industrial Radiographic Exposure Device Model_____

Survey Meter Manufacturer_____

Survey Meter Model_____ Serial No._____ Calibration Due Date_____

		Yes	No
1.	Was the industrial radiographer wearing a film badge or TLD, alarming ratemeter, and a pocket dosimeter?		
2.	Were other individuals working within the restricted area wearing film badges or TLDs, alarm ratemeters and pocket dosimeters?		
3.	Was the restricted area posted with "CAUTION (or DANGER) RADIATION AREA" signs?		
4.	Was the restricted area properly controlled to prevent unauthorized entry?		
5.	Was the high radiation area posted with "CAUTION (or DANGER) HIGH RADIATION AREA" signs?		
6.	Did the industrial radiographer have a calibrated and properly operating survey meter?		
7.	Was the utilization log properly filled out?		
8.	Did the industrial radiographer have sufficient knowledge of safety rules? (Ascertained by oral questions.)		
9.	Was the industrial radiographer working with defective equipment?		

EXHIBIT D (continued)

	Yes	No
10. Did the industrial radiographer conduct an adequate survey of the industrial radiographic exposure device after each exposure and when approaching the guide tube before exchanging films, repositioning the collimator or dismantling equipment?		
11. Were radionuclides stored properly and kept locked to prevent unauthorized removal?		
12. Was the storage area posted with "CAUTION (or DANGER) RADIOACTIVE MATERIAL" signs?		
13. Did the industrial radiographer possess a copy of approved operating and emergency procedures and, as applicable, State or NRC rules and regulations for protection against radiation?		
14. Were there any items of noncompliance other than those listed on this form? (If any, explain in remarks.)		

Remarks_____

ILLINOIS EMERGENCY MANAGEMENT AGENCY

1035 OUTER PARK DRIVE
SPRINGFIELD, ILLINOIS 62704

This State agency is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under 420 ILCS 40/1-40/44. Disclosure of this information is required. Failure to provide any information will result in this form not being processed. This form has been approved by the Forms Management Center.

CERTIFICATE
TERMINATION AND DISPOSITION OF RADIOACTIVE MATERIAL

LICENSEE:	LICENSE NUMBER:
ADDRESS:	
	TELEPHONE NUMBER:

The following information is provided in accordance with 32 Ill. Adm. Code 330.320, "Expiration and Termination of Licenses."
This regulation appears on the back of this form. Check all that apply below.

☐ 1. All use of radioactive material authorized under the above referenced license has been terminated.

☐ 2. Radioactive contamination has been removed to the level outlined in 32 Ill. Adm. Code 340.Appendix A, to the extent practicable.

☐ 3. All radioactive material previously procured and/or possessed under the authorization granted by the above referenced license has been disposed of as follows:

- ☐ Transferred to (Name and Address): _____
  _____
  _____
  _____

  who is authorized to possess such material under License Number _____

  issued by (Licensing Agency): _____
- ☐ Decayed, surveyed and disposed of as non-radioactive waste.
- ☐ Licensed under License Number: _____

  issued by (Licensing Agency): _____
- ☐ No radioactive material has ever been procured and/or possessed by the licensee under the authorization granted by the above referenced license.
- ☐ Other (Attach additional pages).

☐ 4. Attached are radiation surveys or the equivalent as specified in 32 Ill. Adm. Code 330.320(d)(1)(E).

☐ 5. Records required to be maintained for the license requested to be terminated are available at the following location:

Name: _____

Address: _____
_____
_____

Telephone No.: _____ Contact Person: _____

☐ 6. Additional remarks. (Attach additional pages.)

THE UNDERSIGNED, ON BEHALF OF THE LICENSEE, HEREBY CERTIFIES THAT LICENSABLE QUANTITIES OF RADIOACTIVE MATERIAL UNDER THE JURISDICTION OF THE ILLINOIS EMERGENCY MANAGEMENT AGENCY ARE NOT POSSESSED BY THE LICENSEE. IT IS THEREFORE REQUESTED THAT THE ABOVE REFERENCED LICENSE BE TERMINATED.

SIGNATURE: _____ DATE: _____

NAME: _____ TITLE: _____
(print or type)

Section 330.320 Expiration and Termination of Licenses

a) Except as provided in Section 330.330(b), the authority to engage in licensed activities as specified in the specific license shall expire at the end of the specified day in the month and year stated therein. Any expiration date on a specific license applies only to the authority to engage in licensed activities. Expiration of a specific license shall not relieve the licensee of responsibility for decommissioning its facility and terminating the specific license.

b) Each licensee shall notify the Agency immediately, in writing and request termination of the license when the licensee decides to terminate all activities involving radioactive materials authorized under the license. This notification and request for termination shall include the documents required by subsection (d) below and shall otherwise substantiate that the licensee has met all of the requirements in subsection (d) below.

c) No less than 30 days before the expiration date specified in the license, the licensee shall either:

1) Submit an application for license renewal under Section 330.330; or

2) Notify the Agency, in writing, if the licensee decides not to renew the license. The licensee requesting termination of a license shall comply with the requirements of subsection (d) below.

d) Termination of Licenses

1) If a licensee does not submit an application for license renewal under Section 330.330, the licensee shall, on or before the expiration date specified in the license:

A) Terminate use of radioactive material;

B) Remove radioactive contamination to the level outlined in 32 Ill. Adm. Code 340.Appendix A, to the extent practicable;

C) Properly dispose of radioactive material;

D) Submit a completed Agency Form KLM.007; and

E) Submit a radiation survey report to confirm the absence of radioactive materials or to establish the levels of residual radioactive contamination, unless the licensee demonstrates the absence of residual radioactive contamination in some other manner. The radiation survey report shall specify the instrumentation used and certify that each instrument was properly calibrated and tested. The licensee shall, as applicable, report levels or quantities of:

i) Beta and gamma radiation at 1 centimeter from surfaces in units, multiples, or subunits of sieverts or rem per hour;

ii) Gamma radiation at 1 meter from surfaces in units, multiples, or subunits of sieverts or rem per hour;

iii) Removable radioactivity on surfaces in units, multiples, or subunits of becquerels or curies per 100 square centimeters of surface area, or in disintegrations (transformations) per minute per 100 square centimeters of surface area;

iv) Fixed radioactivity on surfaces in units, multiples, or subunits of becquerels or curies per 100 square centimeters of surface areas or in disintegrations (transformations) per minute per 100 square centimeters of surface area;

v) Radioactivity in contaminated liquids such as water, oils or solvents in units, multiples, or subunits of becquerels or curies per milliliter of volume; and

vii) Radioactivity in contaminated solids such as soils or concrete in units, multiples, or subunits of becquerels or curies per gram of solid.

2) If no residual radioactive contamination attributable to activities conducted under the license is detected, the licensee shall submit a certification that no detectable radioactive contamination was found. The Agency will notify the licensee, in writing, of the termination of the license.

3) If detectable levels or residual radioactive contamination attributable to activities conducted under the license are found:

A) The license continues in effect beyond the expiration date, if necessary, with respect to possession of residual radioactive material present as contamination until the Agency notifies the licensee in writing that the license is terminated. During this time the licensee is subject to the provisions of subsection (e) below.

B) In addition to the information submitted under subsections (1)(D) and (1)(E) above, the licensee shall submit a plan for decontamination, if required, as regards residual radioactive contamination remaining at the time the license expires.

e) Each licensee who possesses residual radioactive material under subsection (d)(3) above, following the expiration date specified in the license, shall:

1) Limit actions involving radioactive material to those related to decontamination and other activities related to preparation for release for unrestricted use; and

2) Continue to control entry to restricted areas until they are suitable for release for unrestricted use and the Agency notifies the licensee in writing that the license is terminated.

(Source: Amended at 18 Ill. Reg. 5553, effective March 29, 1994)