ARIZONA
RADIATION REGULATORY AGENCY

ARIZONA RADIATION REGULATORY AGENCY
REGULATORY GUIDE

RADIOGRAPHY

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ARRA - IR July 2011	ARIZONA RADIATION REGULATORY AGENCY APPLICATION FOR RADIOACTIVE MATERIALS LICENSE **INDUSTRIAL RADIOGRAPHY**	

INSTRUCTIONS: Complete all items in this application for a new license or the renewal of an existing license. Use supplemental sheets where necessary. Item 23 must be completed on all applications. **Mail the original to: Radioactive Materials Program, Arizona Radiation Regulatory Agency, 4814 South 40th Street, Phoenix, Arizona 85040.** Keep the second copy for your records. A license will be issued as soon as the application review is completed.

1a. **NAME AND MAILING ADDRESS OF APPLICANT** (Institution, Firm, Individual Owner, etc.) **Include Zip Code**

1b. **STREET ADDRESS(S) AT WHICH RADIOACTIVE MATERIAL WILL BE USED (**If different than 1a.) **Include Zip Code**

☐ Check here if Radioactive material will be used at temporary job sites

2. **PERSON TO CONTACT REGARDING THIS APPLICATION:** **TELEPHONE NO:**

3. **THIS IS AN APPLICATION FOR:** (Check appropriate item)

A. ☐NEW LICENSE* B. ☐AMENDMENT TO LICENSE NO. _____ C. ☐RENEWAL OF LICENSE NO. _____

4a. **RADIATION SAFETY OFFICER (RSO)** (Name and qualifications demonstrating the proposed candidate meets the qualifications in R12-1-5120.

4b. **A copy of a driver's license and social security card is required for all persons listed by name on the license.**

4c. **DUTIES OF RADIATION SAFETY OFFICER**

☐ Attachment "A" Duties attached or

☐ Equivalent Duties attached

5. **RADIOACTIVE MATERIAL** (Isotope)

A. _____

B. _____

C. _____

D. _____

6. **SEALED SOURCE MANUFACTURER AND MODEL NUMBER**

A. _____

B. _____

C. _____

D. _____

7. **ACTIVITY OF EACH SOURCE**

A. _____

B. _____

C. _____

D. _____

8. **DEVICE AND USE DESCRIPTION** (Make lettering correspond to lettering in Items 5, 6, and 7 above)

	MANUFACTURER OF DEVICE	MODEL NO.	NO. OF DEVICES	MFG. OF SOURCE CHANGER	MODEL NO.
A.					
B.					
C.					

9. **TOTAL NUMBER OF DEVICES TO BE LICENSED:** _____

*** FEE REQUIRED FOR NEW LICENSE ONLY (COMPLETE ITEM NO. 19)**

10. **RADIATION DETECTION INSTRUMENTS**
Lists radiation detection instruments (Range 2 mR/hr thru 1 R/hr)

MANUFACTURER	MODEL NO.	RANGE

11. **CALIBRATION OF SURVEY INSTRUMENTS**
(Mandatory for all survey instruments possessed)
(Check one)

☐ Calibration will be done at intervals not to exceed 3 months and after repair

(Check one)
☐ Applicant will do own survey instrument calibrations.
☐ Attachment B procedures will be followed and are Attached; or
☐ Equivalent procedures attached
☐ Calibration will be done by calibration service agency

Name:_____
Address:_____
_____

12. **PERSONNEL MONITORING**
Monthly film badge or TLD exchange.
Supplier Name:_____
Address:_____
_____
NVLAP certified?:_____

DIRECT READING POCKET DOSIMETER and ALARMING RATE METERS(R12-1-523)

MANUFACTURER	MODEL NO.	RANGE

☐ Applicant will perform pocket dosimeter annual checks (Methods and procedures attached)
☐ Pocket dosimeter annual checks will be performed by approved service agency
Name: _____
Address: _____
_____
License No.: _____

☐ Alarming Rate Meter procedures attached

13. **FACILITIES**
☐ Facilities and storage diagram attached. (Include line drawing for each radiographic vault and/or storage area showing dimensions, shielding thickness, density and type of materials for all sides above and below. Show relationship distance to adjacent areas for sides, above and below, and dose rates in those areas.)
(Check if facility has:)
☐ Permanent radiographic installation
☐ Visible signal actuated by radiation
☐ Audible warning actuated by attempted entry
☐ Lock(s)
☐ Unimpeded exit
☐ Sign(s) and/or posting

14. **LEAK TEST PROGRAM** (Check one)
☐ Radiography camera and source will be checked for leaks in accordance with R12-1-505.
☐ Applicant will contract with approved outside consultant to do leak tests
Name: _____
Address: _____
_____
License No.:_____

☐ Applicant will do leak tests using approved leak test kit, mailing leak test kit procedures attached.
Name:_____
Address:_____
_____
Kit No.:_____

☐ Applicant will do own leak test including counting. Detailed procedures attached. (Include instrumentation calibration standard and sample calculation.)

15. **OPERATING AND EMERGENCY PROCEDURES MANUAL**
(Indicate page number of following required items in spaces along side of each item.)

Page No. Radiation surveys
_____ Perimeter of restricted area
_____ After each radiographic exposure
_____ Before storing exposure device
_____ Outside of vehicle used for transportation
_____ Passenger compartment of vehicle used for transportation

Page No. Control of access to radiographic areas
_____ Roping or barricading of area
_____ Surveillance
_____ Locking of exposure rooms
_____ Control of keys to exposure rooms
_____ Use of audible or visual alarms

15. **OPERATING AND EMERGENCY PROCEDURES MANUAL** (Continued)

Page No. Posting of radiographic areas
_____ Radiation areas or perimeter of restricted area
_____ High radiation areas

Page No. Inspection/maintenance of equipment
_____ Daily inspection prior to use (Checklist and instructions)
_____ Type B Package QA Program

Page No. Quarterly inspection and preventative maintenance
_____ All connectors
_____ Drive cables
_____ Source guide tubes (check for wear and contamination, clean and lube)
_____ On-Off indicators
_____ Moving parts (check for defects & wear)
_____ Repair/Replace defective/worn components or remove from service
_____ Records kept for two years

Page No. Quarterly tests of fixed facilities
_____ Visible and audible warning systems
_____ Door interlocks
_____ Access door lock
_____ Signs and posting

Page No. Transportation
_____ Securing and bracing of equipment
_____ Survey, label, papers, placarding
_____ Registration of Type B container
_____ Q.A. Program for Type B container

Page No. Use of Equipment
_____ Step-by-step procedures for exposure devices
_____ Source changer step-by-step procedures

Page No. Locking and securing sources of radiation
_____ Post-exposure survey
_____ Securing device after post-exposure survey
_____ Procedures for storage of devices & sources

Page No. Product malfunction/defect
_____ Notification procedures

Page No. Emergency procedures
_____ Procedures to minimize exposure in accidents or unusual circumstances
_____ Notification procedures (include names, phone numbers)

16. **WASTE DISPOSAL**

☐ Returned to manufacturer for disposal
☐ Other (detailed procedures attached)

17. **MANAGEMENT CONTROLS**

☐ Organizational chart attached
☐ Duties and responsibilities (other than RSO) (list specific positions) attached
☐ Checklist for quarterly internal audit attached
☐ Procedures for reporting and recording deficiencies Attached
☐ Program to correct deficiencies attached

18. **PERSONNEL**

A. RADIOGRAPHERS (Names, Certification Number, and Expiration Date of individuals who will use or directly supervise use of Radioactive Material)

Name	Certification Number (Certifying Body)	Expiration Date

B. RADIOGRAPHY ASSISTANTS (Names of individuals who will work under direct supervision of a radiographer)

☐ Each assistant's name shall be listed on the license as an assistant.
☐ Proof of qualifications, for an assistant, will need to be submitted to the Agency with the request to have the assistant listed on the license.

Name	Certification Number (Certifying Body)	Expiration Date

C. TRAINING AND EXPERIENCE
(Check one or both)

☐ Detailed training and experience attached.
☐ Initial and annual refresher training involving the licensee's specific operating and emergency procedures, and demonstration of hands-on competency as required in R12-1-511 and R12-1-521.

D. TRAINING PROGRAM

☐ Full in-house training program (Submit information required in ARRA Regulatory Guide 10.6, "Guide for Preparation of Application For Use of Sealed Sources and Devices For Performing Industrial Radiography")
☐ Limited in-house training program (Submit information required in ARRA Regulatory Guide 10.6, "Guide for Preparation of Applications for Use of Sealed Sources and Devices For Performing Industrial Radiography")
☐ Other (Attach detailed information)

19. **ANNUAL LICENSE FEE REQUIRED**
(See AAC Title 12, Chapter 1, Article 13)

License Fee Category: **Industrial Radiography(C11)**
License Fee Enclosed: $_____
(Renewal Fee not required)

20. ☐ **LETTER TO LOCAL GOVERNING AUTHORITY ENCLOSED**
(See R12-1-309(5))

21. **ALARA PROGRAM**
☐ ALARA program will be initiated in accordance with R12-1-407.
☐ A description of ALARA program is attached

22. **LEGAL STRUCTURE/CITIZENSHIP**
☐ Described LEGAL STRUCTURE on attachment G
☐ A copy of a DRIVERS LICENSE and SOCIAL SECURITY CARD is provided for each person that will be listed on the license is provided

23. **INCREASED CONTROLS**
The applicant understands the importance of INCREASED CONTROLS. Enclosed is a description of the program that will be initiated to ensure control of industrial radiography radiation sources.

ITEM 24 - CERTIFICATION
(This item must be completed by applicant)

THE APPLICANT AND ANY OFFICIAL EXECUTING THIS CERTIFICATION ON BEHALF OF THE APPLICANT NAMED IN ITEM 1, CERTIFY THAT THIS APPLICATION IS PREPARED IN CONFORMITY WITH ARIZONA ADMINISTRATIVE CODE, TITLE 12, CHAPTER 1, AND THAT ALL INFORMATION CONTAINED HEREIN, INCLUDING ANY SUPPLEMENTS ATTACHED HERETO, IS TRUE AND CORRECT TO THE BEST OF THE APPLICANT'S KNOWLEDGE AND BELIEF.

_____ By:_____
(Type or Print name of Certifying Official) (Signature)

_____ Date:_____
(Title of Certifying Official)

ARIZONA RADIATION REGULATORY AGENCY

GUIDE FOR THE PREPARATION OF APPLICATIONS FOR USE OF SEALED SOURCES AND DEVICES FOR PERFORMING INDUSTRIAL RADIOGRAPHY

I. PURPOSE OF GUIDE

This guide is designed to describe the type and extent of information needed by the Agency to evaluate an application for an industrial radiography license. Attachments A through G to this guide are provided to describe model radiation safety procedures. Each applicant should carefully read the applicable rules and model procedures and then decide if the model procedures are appropriate for its specific radiation safety needs. In the application, applicants may certify that they will follow a model procedure or may develop their own procedure and enclose it for review.

II. FILING AN APPLICATION

An application for a license is made by completing form ARRA-IR. If additional room is required for any item in the application, additional sheets may be added. Identify and key each separate sheet or document submitted with the application to the item number on the application to which it refers.

All items should be completed in enough detail to allow the Agency to determine that the equipment, facilities, training and experience, and radiation safety program are adequate to protect health and minimize danger to life and property.

As all license applications are available for review by the general public, every attempt will be made to protect private and security related information. For example, the training and experience of individuals should be submitted to demonstrate their ability to manage radiation safety programs or to work safely with radioactive material. Home addresses and home telephone numbers should be submitted if they are part of an emergency response plan. Copies of drivers' license and social security cards, and radiation dose information must be submitted to the Agency to complete the application process. Remember, the applicant may request that information be handled so that it is kept from public viewing.

The application should be submitted to the address shown in Section III of this guide. The applicant should retain a copy as the applicant will be required to possess and use licensed material in accordance with the statements and representations made in the application and any supplements to it.

III. CONTENTS OF AN APPLICATION

This portion of the guide explains, item by item, the information requested on Form ARRA-IR. The Attachments to this guide serve several different purposes, i.e., to provide additional information on certain subject areas, to provide a model procedure the licensee may adopt in response to an item on the application form, or to provide an outline the applicant may use to develop a procedure for review by the Agency staff.

If, after careful review of this guide, applicants have specific questions, they should contact the Radioactive Materials program staff at:

Arizona Radiation Regulatory Agency
Radioactive Materials Program
4814 South 40th Street
Phoenix, Arizona 85040
(602) 255-4845
FAX (602) 437-0705
www.azrra.gov

Item 1a: **Name and Mailing Address of Applicant.**

Enter the name, mailing address and telephone number of the applicant. It is particularly important that the mailing address be sufficiently complete so that all correspondence to the licensee will reach persons responsible for the radiation safety program.

Item 1b: **Street Address(es) at Which Material Will Be Used.**

List the address(es) and location(s) where radioactive material will be used. If multiple addresses are to be used, explain the extent of use at each address and the facilities and equipment located at each place of use. The actual locations of use should be listed, whether or not they are the same as the mailing address in Item 1.a.; e.g., a P.O. Box may be most suitable for Item la. in some cases, but a P.O. Box does not adequately describe the location of use. Item lb. must be an in-state address. Check the block for temporary job sites if this application is for mobile industrial radiography operations.

Item 2: **Person to Contact Regarding this Application.**

Enter the name and telephone number (including area code) of the individual. This individual should be familiar with the proposed radioactive materials program and be able to answer questions about the application. This individual will serve as the point of contact during the review of the application and during the period of the license.

Item 3: **Type of Application.**

Indicate whether this is an application for a new license, an amendment, or a renewal. If this application is for a new license, complete Item 20 also. The appropriate license fee must accompany the application in order for the review process to begin.

Item 4a: **Radiation Safety Officer (RSO).**

State the name and title of the person designated by, and responsible to, the institution's management for the coordination of the institution's radiation safety program. The RSO should be a full-time employee of the licensee. If the RSO is assisted by a consultant or part-time employee, state the consultant's name and describe his duties, responsibilities, and the amount of time to be devoted to the radiation safety program. Also, submit the name of the person responsible for the radiation program on a day-to-day basis.

A radiation safety officer candidate shall meet the following qualifications, as required in R12-1-512:

1. Complete the training and testing requirements in R12-1-521;
2. Have participated in 1 year (2000 hrs) of hands-on experience as a radiographer; and
3. Have participated in formal training in the establishment and maintenance of a radiation safety program.
4. The Agency will consider other forms of radiation safety training when evaluation a candidates qualifications.

Item 4b: **A candidate must provide** (required for personnel listed on the license) **a copy of a driver's license and social security card. A listing of the number is not sufficient.**

Item 4c: **Duties of the Radiation Safety Officer**

Attach to the application the radiation safety training and experience of the RSO. Indicate by checking the appropriate box whether the RSO duties will be as outlined in model duties of Attachment A or whether equivalent duties are attached.

Items 5, 6 and 7: Radioactive Material Description

Identify the radionuclide that will be used in the radiography device. Identify the manufacturer and model number of the sealed source that will be used in the radiography device. Specify the maximum amount of radioactive material that will be in each named source and the total possession limit required.

Identify other sealed sources (i.e., any source that will not be used for performing radiography) which may be possessed by radionuclide, manufacturer, model number, and maximum amount (activity) of radioactive material in the source. For example, identify a sealed source and device that will be used for instrument calibration.

Because of the large area that requires surveillance, sources that exceed 200 Curies of Iridium-192 or 100 Curies of Cobalt-60 will not be routinely approved for temporary job site use. Sources that exceed these amounts should only be used in shielded permanent facilities. If the use of sources exceeding these limits at temporary job sites is desired, provide specific information concerning: where the sources will be used; the conditions of use; transportation and storage; and how surveillance will be conducted to prevent entry into the restricted area. Operating and Emergency Procedures should provide special instructions governing the use of such sources with particular emphasis on area surveillance.

The licensee is now required to submit a sealed source and device registry description (copy)for each source used to conduct radiography operations. Maintain a copy in your records.

Item 8: Device and Use Description

Radiographic exposure devices must be designated by the current manufacturer and model number, and should be keyed alphabetically to the sources listed in Items 5, 6, and 7 with which they will be used. Indicate in the appropriate columns, the number of each type of device to be utilized, and the manufacturer and model number of the source changers to be used with each exposure device.

The licensee is now required to submit a sealed source and device registry description (copy) for each camera used to conduct radiography operations. Also, a certificate of compliance (coc) must be provided for all transportation containers (to include all overpacks). Maintain a copy in your records.

Item 9: Total Number of Devices to be Licensed

Enter the total number of exposure devices to be licensed.

Item 10: Radiation Detection Instruments

List the radiation detection instruments (survey instruments) by manufacturer, model number, and exposure range. Instruments to be used for surveys are required by Arizona Administrative Code (AAC) R12-1-504(A) to measure from a minimum of two milliroentgens per hour through one roentgen per hour.

Item 11: Calibration of Survey Instruments

AAC R12-1-504(B) requires that a licensee maintain sufficient calibrated and operable survey meters to make physical radiation surveys and that the instruments shall be calibrated at intervals not to exceed three months and after each instrument repair. Indicate that survey instruments will be calibrated as required by checking the appropriate box on form ARRA-IR.

An adequate calibration of survey instruments cannot be performed with built-in check sources. Electronic calibrations that do not involve a source of radiation are also not adequate to determine the proper functioning and response of all components of an instrument.

A survey instrument may be considered at one point properly calibrated when the exposure rate measured by the instrument differs from the true exposure rate by less than 20 percent.

If you propose to calibrate your own radiation survey and monitoring instruments, submit a detailed description of your planned calibration procedures. Include in the description:

1. The manufacturer's name and model number of the source to be used. The source should be of sufficient strength to give at least a 2/3 scale reading on the highest scale to be calibrated when the source is 20 cm from the effective center of the detector.

2. The nuclide and either (a) activity (in millicuries or equivalent SI units) of radioactive material contained in the source, or (b) exposure rates at fixed distances from the source as certified by measurements involving direct comparisons with sources or dosimeters calibrated at the National Institute of Standards and Technology (NIST).

3. The accuracy of the source. Accuracy is the maximum deviation of the nominal value of the source from the true value. This information is normally provided by the manufacturer.

4. The step-by-step procedures, including associated radiation safety procedures. For each instrument, these procedures should include a two-point calibration on each scale used for radiation protection surveys.

   If a consultant or outside firm will perform the calibration of the radiation survey and monitoring instruments, specify the name, address, and license number of the firm. Contact the firm, or consultant that will provide the calibration, to determine whether information concerning calibration services and procedures has been filed with the Agency. If this information has not been filed, submit it with your application including details the outside firm will supply you about the results of the calibration.

   Attachment B contains an acceptable procedure for calibrating survey instruments and a form that may be used to supply the information required in Item 11 of form ARRA-IR. If the procedures described in Attachment B will be followed, sign, date, and include Attachment B with the application. If the procedures in Attachment B are not followed, check the appropriate box and submit equivalent procedures.

   Submit a description of the calibration procedures. They should include, at a minimum:

   A. The manufacturer's name and model number of any sealed sources to be used.

   B. The nuclide and activity (in millicuries or becquerels) of radioactive materials in the standards.

   C. The accuracy of the standard and NIST or foreign equivalent traceability.

   D. The step-by-step procedures used for calibration.

Item 12: Personnel Monitoring

AAC R12-1-523 requires that radiographers and radiography assistants wear an alarming ratemeter, either film badges or thermoluminescent dosimeters (TLDs), and a direct-reading pocket dosimeter at all times during radiographic operations. The personnel monitoring equipment chosen for use in radiography operations shall meet the requirements specified in AAC R12-1-523.

Check the appropriate box for whether the applicant will perform annual accuracy and drift checks or that an approved agency will perform such checks. If the applicant will perform the checks, submit a copy of the procedures to be utilized. If an outside agency will perform the checks, provide the name, address and license number of the agency.

Item 13: Facilities

Describe the permanent storage facility for radioactive material and, if applicable, the permanent radiographic installation. Provide an annotated sketch or drawing of the facility and its surroundings that shows:

1. The scale to which the sketch or drawing is made (the same scale should be used for all sketches and drawings). The recommended scale is 1/4 inch = 1 foot.

2. The type, thickness, and density of shielding materials on all sides, including the floor and roof.

3. The locations of all entrances and exits, and other points of access to the facility.

4. A description of the nature of the areas adjacent to the facility and the distance to these areas. Include information on areas adjacent to, above, and below the facility.

5. The actual storage area for radiography sources and devices.

   A permanent radiographic facility is at a fixed location, is shielded so that the area outside the facility is an unrestricted area, and is not under continuous surveillance. If the facility is used only occasionally for performance of radiography, it still is considered a permanent facility because it is the nature of the facility, rather than the frequency of use, that determines if the facility is a permanent radiographic facility.

   For permanent radiographic facilities, in addition to the information required above, the following must also be provided:

6. A description of the visible-audible signal system and how it meets the requirements of AAC R12-1-509. The visible signal must be activated only by radiation whenever the source is exposed, be clearly visible day or night at the boundary of the restricted area, and must be activated only when an attempt is made to enter the facility when the source is exposed. The recommended frequency for the alarm is in the 2,000 - 5,000 Hertz range, and should be a minimum of 5 - 10 Decibels greater than normal ambient work noise. The requirement for the visible audible signal system is in addition to other measures which may be taken to prevent access into the facility (i.e., locked doors).

7. The results of actual radiation level measurements adjacent to, above, and below the facility. The radiation level in all directions around the facility, including the roof, shall not exceed 2 milliroentgens per hour. Clearly identify the type of source (nuclide), the amount of radioactive material in the source, use, composition, weight and orientation of collimator, and the position of the source within the facility for the measurements.

   Variances will be considered if construction requirements preclude shielding the roof to meet the 2 milliroentgens per hour requirement. Provide the following information to obtain approval for a variance:

   A. Means of access to the roof.

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

   C. A commitment that the roof will be posted with "Caution (or Danger) Radiation Area" signs and have an appropriate perimeter barrier.

   D. The steps taken to minimize radiation on the roof.

   E. A radiation level that exceeds 100 milliroentgens per hour will not be considered acceptable. This radiation constitutes a High Radiation Area and requires special precautions such as the visible-audible signal system required by AAC R12-1-509.

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

Item 14: Leak Test Program

Include with the application, a copy of the procedures to be followed in case a leaking source is discovered.

The leak testing of sealed sources may be performed only by persons who are specifically authorized by the Agency, NRC, or another Agreement State to do so. In establishing a program for leak testing, one of three approaches may be chosen. Indicate which method will be followed by checking the appropriate box on the application.

1. The applicant may utilize the services of a consultant or commercial organization licensed by the Agency, NRC, or another Agreement State to perform leak tests. Submit the name, address, and license number of the consultant or commercial agency.

2. The applicant may be licensed by the Agency to use a commercially available leak test kit to obtain leak test samples. The application must specify the name and address of the manufacturer of the leak test kit (and analyzer of the leak test samples). The manufacturer's leak test kit procedures, or leak test procedures as adapted to the applicants operation, must be attached. Also identify who will use the kits to perform leak tests. If radiographic personnel will perform leak tests, specific instructions for personnel must be included in the Operating and Emergency Procedures.

3. The applicant may be licensed by the Agency to perform leak tests, including the taking and evaluation of wipes. In this case, attach a copy of the procedures to be used. The following information must be included:

   A. A description of the instrumentation, including its sensitivity and accuracy, to be used in evaluating the samples.

   B. A description of the calibrating and standardizing procedures with a sample calculation showing conversion of results to the required microcurie units. Survey instruments are generally not designed for such measurements and are not acceptable for this use.

   C. A description of the material to be used in taking the smears and the points of the equipment that will be smeared (smears should not be taken directly from the surface of a source).

   D. The radiation safety procedures to be followed during the smearing process and the method for handling and disposing of the smears.

   E. A description of the training and experience of each person who will take and/or evaluate the smears.

   Sources must be tested for leakage and contamination at intervals not to exceed 6 months in accordance with R12-1-505(B). Exposure devices containing depleted uranium (DU) as shielding and an “S” tube configuration shall be tested for DU contamination at intervals not to exceed 12 months in accordance with R12-1-505(E). Records of the testing, identifying each source tested, the date of the test, and the results of the test in units of microcurie or becquerel, shall be retained for three years after the next required leak test is performed.

Item 15: Operating and Emergency Procedures Manual

AAC R12-1-521(B) requires each licensee to provide radiography personnel with current Operating and Emergency Procedures. The purpose of this requirement is to provide radiography personnel with clear and specific instructions as contained in AAC R12-1-522 and other duties and responsibilities that radiography personnel may have. Other duties could include instrument calibration, leak testing, quarterly inspection, preventative maintenance of equipment, and shipment of sources and devices. The Operating and Emergency Procedures for personnel should not contain information that does not apply specifically to the duties of radiography personnel. If procedures are superseded, retain the superseded material for three years after the change.

The Operating and Emergency Procedures manual must be as concise as possible, containing clear and specific instructions in the duties of the radiography personnel, and tailored to fit the program proposed in the application. The procedures and instructions must be complete and self-contained in a single document or in a clearly designated part of a broader scope document. Information contained in equipment manuals and other publications should be extracted and inserted into the Operating and Emergency Procedures manual. The instructions contained in the Operating and Emergency Procedures should be in language that can be easily understood by radiography personnel. (Where applicable, instructions for use and handling of devices incorporated into permanent radiographic installations should be separate and distinct from those for mobile or portable devices.)

The Operating and Emergency Procedures should be a sequential set of instructions that cover radiography operations from the beginning of the workday to the end of the workday. Topics that shall be included in the Procedures are:

1. Handling and use of sources of radiation, radiographic exposure devices, source exchangers, and instrument calibration equipment.

   Step-by-step instructions of the "cookbook" type for the use and handling of radiographic exposure devices and related equipment must be provided. When appropriate, the Procedures must include instructions for the use of radiation collimators or other auxiliary shielding material.

   If source exchange will be performed by radiography personnel, step-by-step instructions must be in the Procedures. The instructions should include surveys to be performed during the source exchange, for shipment, and acceptable radiation levels for these surveys. Such instructions must also state the steps to be taken if survey levels exceed acceptable levels.

   If radiography personnel will perform instrument calibration, step-by-step instructions must be in the Procedures.

   If radiography personnel will perform leak testing of sealed sources and exposure devices, specific instructions for performing the leak test must be in the procedures. If the applicant will use commercially available leak-test kits, the instructions and procedures provided by the kit suppliers should be modified to fit the applicant's program. For example, many kit procedures indicate that the manufacturer of the source should be notified if a survey of the leak-test sample indicates a potentially leaking source. Instructions should indicate that management will be informed since dealing with suppliers is usually a management function.

2. Methods and occasions for conducting radiation surveys.

The Procedures must identify when surveys should be made, what must be surveyed, acceptable radiation levels for the surveys, the steps to be taken if acceptable levels are exceeded, and recording of survey results. In general, a survey must be performed each time a source is manipulated or moved. Surveys that must be performed include:

A. Determination of the boundaries of the restricted area.

B. Determination after each exposure that the source has returned to the safe storage position. All entrance and exit ports of the radiographic device must be surveyed. If the radiographic exposure device has a source guide tube, the survey must include the entire guide tube.

C. Determination that the source is in a safe storage position prior to securing a radiographic exposure device or storage container.

D. Determination of radiation levels at external surfaces of storage facilities needs to be performed periodically, in order to ensure that exposure rates in unrestricted areas do not exceed the limits specified in AAC R12-1-406. Specify the frequency at which surveys will be made (at the time of the quarterly inventory is recommended).

E. Determination of radiation levels in and around vehicles used for transporting or storing sources and devices.

F. Preparation of the Shipping (Transport) Paper **Attachment G**

The following information is important when ensuring your shipment complies with AAC Article 15 and Department of Transportation (DOT) regulations. If the DOT regulations do not authorize a particular container for a hazardous material, the material may not be shipped or transported in that container. Radioactive material used in industrial radiography is typically shipped in a Type B package. Users of Type B packages must register with the USNRC as a user of the type of container being used for transport. **Remember, anytime the activity of an Ir-192 source exceeds 27 Curies (999 GBq), it must be transported in a Type B package.**

Listed below are the package specifications for some typical exposure devices and source changers used to ship radioactive sources used in industrial radiography:

Amersham OPL-660 and OP-66	USA/9283/B(U) Type B
Amersham Model 680-OP	USA/9035/B(U) Type B
Amersham Model 650 L	USA/9269/B(U) - 85 Type B
INC Model Ir-100	USA/9157/B(U) - 85 Type B
AEA Model 880	USA/9296/B(U) - 85 Type B

NOTE: An **Overpack**, if used by a single consignor, as defined in 49 CFR 171.8 must be marked and labeled as to its contents. An overpack is an enclosure used to provide protection or convenience in handling the package(s). When an overpack is used, it must be marked with the proper shipping name, identification number, and a statement indicating that the inner packages comply with all DOT packaging requirements for transportation of hazardous material, and labeled for each hazardous material it contains, unless the information on each package is visible while in the overpack.

3. Methods for controlling access to radiographic areas.

   AAC R12-1-429 requires posting of Radiation Areas and High Radiation Areas, respectively.

   For temporary job site radiography, 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 2 milliroentgens per hour radiation level and to make a confirming survey after the source has been exposed.

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

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

   AAC R12-1-531 requires direct surveillance to protect against unauthorized entry into a high radiation area except where the high radiation area is equipped with a control device or alarm system or where the high radiation area is locked to protect against unauthorized or accidental entry.

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

4. Methods and occasions for locking and securing radiographic exposure devices, storage containers, and sealed sources.

   AAC R12-1-503 requires that locked radiographic exposure devices and storage containers be physically secured to prevent tampering or removal by unauthorized personnel. It is not acceptable to merely chain or secure a device containing a source to a fence or post. Unless a radiographer or radiography assistant is physically present to maintain surveillance, a device containing a source should be placed in storage so that it is not accessible to unauthorized persons.

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

   The storage facility should be such that radiation levels shall not exceed that which, if an individual were continuously present in the area, could result in the receipt of a dose in excess of 2 milliroentgens in any one hour or could result in receiving a dose in excess of 100 milliroentgens over a period of 1 year. If these limits are exceeded, the area shall be a restricted area. The facility should be posted with "Caution (or Danger) Radioactive Material" signs. A physical survey shall be performed to confirm that the area around the storage facility meets the requirements outlined above.

   AAC R12-1-502(C)(3)(b) requires that devices be secured in the shielded position each time the source is returned to that position. The procedures for using the devices must require locking the device at the end of each exposure. A radiation survey must be performed to confirm that the source is in the safe, shielded position. For crank out devices, the survey must include the guide tube and the device itself.

5. Personnel monitoring and the use of personnel monitoring equipment.

   AAC R12-1-523 states that no individual may act as a radiographer or radiography assistant unless during radiographic operations, that person wears an alarming ratemeter, either a film badge or TLD, and a direct-reading pocket dosimeter at all times. Personnel shall be instructed that they are required to use these personnel monitoring equipment. Personnel shall be instructed to charge their pocket dosimeters at the start of each workday so that the dosimeters are capable of reading full scale. The dosimeter readings shall be recorded at the beginning and end of each workday.

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

6. Transporting sealed sources to field locations, securing exposure devices and storage containers in the vehicles, placarding of vehicles, and control of sealed sources during transportation.

   Transport of radiography sources in exposure devices or storage containers via public roads is subject to the regulations of the US DOT (49 CFR), by AAC R12-1-1504, and license conditions. These rules and regulations cover, among other things, permissible radiation levels around and within a vehicle and placarding of the vehicle during transport. Information should be extracted and placed into the instructions so that personnel know exactly what they are expected to do. The following items must be covered in instructions to personnel:

   A. Labeling containers with the appropriate label as specified in DOT's regulations, i.e., instruction on how to determine which label (Radioactive White I, Radioactive Yellow II, or Radioactive Yellow III) must be used.

   B. Securing the exposure device or storage container within the transportation vehicle. The instructions should specify how the package is to be secured in the vehicle so that it cannot move during transport.

   C. Placarding both sides, the front, and back of the vehicle with "RADIOACTIVE" placards if the package being transported requires a Radioactive Yellow III label. Such placarding should not be used when not required.

   D. Surveying the exterior surfaces and passenger compartment of the vehicle to ensure that the radiation levels do not exceed 2 milliroentgens per hour in the passenger compartment. Include instructions to personnel on the measures that should be taken if the radiation level exceeds 2 milliroentgens per hour in the passenger compartment. For example, instruct them to add more shielding or reposition the device within the vehicle.

   E. 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 of Radioactive Yellow III label were transported should be removed and "Caution (or Danger) - Radioactive Material" signs should be substituted. The vehicle should be locked when it is used for storage.

   F. An example transport document is provided as Attachment G. The applicant shall use this form when transporting radioactive sources, or provide an example of a similar form that contains the information required in the transportation regulations. If the applicant chooses to use the example form, the applicant shall return the form with the application, making any changes or additions applicable to the applicant's radiation safety program.

7. Minimizing exposure of persons in the event of an accident/emergency procedures.

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

   Radiography personnel should not attempt to perform operations involving retrieval or recover of a source not in the shielded position unless they have had specific instruction and actual practice in retrieval operations with a dummy source. If radiographic personnel will perform source retrieval or recovery, include the training program and a description of the instruction that will be given, including practice with a dummy source and what special equipment, available for emergencies, will be used. In addition, include specific instructions for source retrieval in your Operating and Emergency Procedures.

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

   A. Establish and post the restricted area at the 2 milliroentgens per hour radiation level.

   B. Maintain continuous surveillance of the restricted area until the situation is corrected.

   C. Notify management or other appropriate persons.

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

8. 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.

9. Maintenance of records.

   When the license is granted, the following records must be generated and retained:

   A. Utilization logs as required by AAC R12-1-507. The instructions to personnel should clearly specify the need for the utilization log. The elements required are:

      1. A description (or make and model number) of each source of radiation or storage container in which the sealed source is located;

      2. The identity of the radiographer to whom assigned; and

      3. Locations where the device is used and the dates of use.

   B. Records of daily inspection of equipment as required by AAC R12-1-508. Instructions to personnel should specify that a record be made of the daily inspection.

   C. Dosimeter readings as required by AAC R12-1-523. These readings shall be made at the beginning and end of the work shift. Instructions to personnel shall specify that the readings be recorded.

   D. Results of the physical survey following the final exposure of the day or operations. Instructions to personnel shall specify that a record of the final survey be made.

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

Do not include instructions about records that are solely the responsibility of management.

10. Daily inspection and maintenance of exposure devices, related equipment and storage containers.

AAC R12-1-508 requires that exposure devices, storage containers, and source changers be checked for obvious defects prior to use each day the equipment is used.

The instructions to personnel must clearly reflect the 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 must be checked at the start of each shift.

Specify in the instructions to personnel the items that must be checked and the steps to be taken if any defects are found in the equipment. Manufacturers of the equipment can provide a list of items that should be checked in the daily inspection. The instructions should be tailored to the devices authorized by the license for use. A record of the performance of the daily inspection must be made. Attachment C provides examples of instructions for daily inspections of radiographic devices. The applicant's instructions should be tailored to the specific program and devices requested.

11. Off Scale dosimeter readings.

AAC R12-1-523 requires that an individual's film badge or TLD be immediately sent for processing if the direct-reading pocket dosimeter is found to be off scale. There are no exceptions to this requirement.

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

A. Stop work immediately and place the source in a safe storage position in the exposure device.

B. Have the individual film badge or TLD processed immediately.

C. Notify the individual specified in the emergency procedures.

12. Product malfunctions and defects.

If the radiographer discovers any malfunction or defect in the equipment, the radiographer must notify the Radiation Safety Officer.

13. Increased Controls

There is a listing of Increased Control Topics at the end of this guide that must be addressed if this application will be accepted by the Agency for an industrial radiography license. The Increased Controls Program is an integral part of the operating and emergency procedures employed by an industrial radiography licensee.

Item 16: Waste Disposal

Waste disposal can usually be accomplished by returning all waste to the manufacturer. If it is desired to use another firm, or individual other than the manufacturer of the sealed sources for waste disposal, then this firm or individual must hold a specific radioactive materials license to perform such services. Sealed sources may only be transferred to a person or firm holding a specific license for receipt or disposal of the specific type and amount of radioactive material involved.

Specify on the application whether radioactive waste will be returned to the manufacturer or whether some other arrangement will be followed. If other, attach an explanation to the application.

Item 17: Management Controls

Submit a description of the overall organizational structure of the radiography program, including specific delegation of authority and responsibility for the program. The applicant should describe how active control over the radiography program is exercised by management personnel in positions of authority. Each individual in the line of authority should be identified by name and title. If the RSO delegates some of his duties and responsibilities to persons of lesser authority, the application must identify those persons and specify how management will ensure that their duties are properly performed.

An internal inspection system must ensure that state rules, license provisions, and operating and emergency procedures are followed by radiographers and radiography assistants. The description of the internal inspection program should include the specific matters to be considered in an inspection and a discussion of management action to be taken to correct any deficiencies. The internal inspection program must cover field audits of each radiographer and radiography assistant, while actually performing radiography, at intervals not to exceed three months.

Inspections must be made on the job and should, insofar as possible, be unannounced. If a radiographer or radiography assistant does not perform radiography for a period that exceeds three months, the inspection must be carried out the very next time the individual engages in radiographic operations.

Specify the name, training, and experience of each individual who will conduct internal inspections. An individual who conducts internal inspections must have a minimum of 1 year of actual experience as a radiographer. Attachment D provides an example of an acceptable, generic, internal inspection checklist. Provide as an attachment to the application, a copy of the internal inspection checklist to be used by the applicant. The checklist should be tailored to the specific program and devices requested.

The Agency is now requiring Increased Controls. Please see Attachment H.

Item 18: Personnel/Training

Signify in the application whether the applicant will maintain a Full In-House Training Program, a Limited In-House Training Program, or a Very Limited In-House Training Program. These are defined as follows: (1) A Full In-House Training Program consists of a formal classroom in-house initial training program for radiographers, orientation to in-house equipment and procedures, and annual refresher training. (2) A Limited In-House Training Program consists of orientation to in-house equipment and procedures for previously trained industrial radiographers, and annual refresher training. (3) A Very Limited In-House Training Program consists only of annual refresher training for permanently established radiographers and who are specifically named on the license.

Provide a description of the complete training program for new radiographers and experienced radiographers. This description must include appropriate references to any instruction given by outside service agencies. The name, training, and experience with radiation of each person who will provide substantial input for the instruction, examination, or qualification of a radiography assistant must be given in sufficient detail to establish the individuals' qualifications to perform these services. If an individual will teach only certain parts of the course, this should be specified. Attachment E describes the elements of an acceptable training program.

The qualifications of each individual designated as a radiographer shall be demonstrated in the following manner:

A. The individual's name, and

B. With a copy of a current radiographer certification card accepted by the Conference of Radiation Program Directors (CRCPD), or equivalent.

C. The following additional information shall be provided as part of the applicant's radiographer training program:

1. A description of the applicant's instruction that a prospective radiographer or radiography assistant will receive concerning:

a. Operating and Emergency Procedures, and

b. The method used to determine competency of an individual to act as a radiographer or a radiography assistant.

2. A description of the periodic training program for radiographers and radiography assistants.

In Item 18(A), list the individuals who will function as radiographers, and their certification number and certification expiration date. In Item 18(B), list those individuals who will be radiography assistants. .

Certification of radiographers is required in R12-1-521. Certification and testing is through ASNT. The Agency offers testing at the Agency on an as-needed-basis. Contact the ASNT, currently Jennifer Harris, for testing and cost information. The certification is for five years. A radiographer will not be allowed to work if the certification expiration date on the radioactive material license is not current. Other certifications may be recognized by the Agency. Contact the Agency for a list of acceptable certifications– a good rule-of-thumb: if it is accepted by the NRC, it will be accepted by the State of Arizona.

Item 19: License Fee

If this is an application for a new license, the appropriate fee must accompany the application before review can begin.

Item 20: Letter to Local Governing Authority

Attach a copy of the letter to the Mayor's office of the city or town in which the radioactive material will be used, or, if not within an incorporated community, to the County Board of Supervisors, providing the following information: (1) the nature of the proposed activity involving radioactive materials, and (2) the facility, including use and storage areas.

Item 21: ALARA Program

An ALARA program is required in accordance with AAC R12-1-407. The applicant may request a copy of ARRA Regulatory Guide 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures As Low As Reasonably Achievable", to assist in developing an ALARA program.

Item 22: Legal Structure

Describe the legal structure of your business using Attachment F.

Item 23: Increased Controls

Licensing requirements for Increased Controls are found in Attachment H. A license application for industrial radiography without an Increased Control program will not be accepted by the Agency.

Item 24: Certification

Each application for a radioactive materials license must be signed and dated by an appropriate corporate or company official. The application must be signed by corporation management or a company owner, and the application may not be signed by the RSO, unless the Agency has on file an authorization from corporate management or a company owner that the RSO is authorized to make commitments for the company.

IV. AMENDMENTS TO LICENSES

Licensees are required to conduct their programs in accordance with statements, representations, and procedures contained in the license application and supporting documents. The license must therefore be amended if the licensee plans to make changes in the facilities, equipment (including types of monitoring and survey instruments), procedures, personnel, radiation safety officer, or radioactive material to be used **before** any such changes are implemented, in whole or in part.

Applications for license amendments may be filed either on the application form or in letter form. The application should identify the license by license number. References to previously submitted information and documents should be clear and specific and should identify the pertinent information by date, page and paragraph.

Amendment applications should be signed and dated by a representative of the licensee's administrative management (e.g., corporate management or company owner). An original and one copy of the application for amendment should be prepared, and the original should be submitted, as in the case for new or renewal applications.

Retain one copy of the application with all attachments because the license will require, as a condition, that the institution follow the statements and representations set forth in the application and any supplement to it. Mail the original to:

Arizona Radiation Regulatory Agency
Radioactive Materials Program
4814 South 40th Street
Phoenix, Arizona 85040
(602) 255-4845
Facsimile No. (602) 437-0705
www.azrra.gov

ATTACHMENT A

DUTIES OF THE RADIATION SAFETY OFFICER FOR INDUSTRIAL RADIOGRAPHY LICENSES

The individual or individuals assigned the duty and responsibility of maintaining active management of the radiation control program must at least meet the requirements for an industrial radiographer. The Radiation Safety Officer (RSO) must possess a thorough knowledge of equipment, procedures, and rules, and a level of competency at or above that expected of a radiographer. As a general guideline, the Agency expects the RSO to be a qualified radiographer with at least two years experience with the equipment and procedures that the applicant is likely to encounter. The RSO must be available for advice and assistance on radiation safety matters.

The following list of responsibilities and duties is not all inclusive nor should it be interpreted as a requirement that any one person assume all the listed duties. Information pertaining to the applicant's specific program should be submitted and include such duties as:

1. Serve as the applicant's liaison with the Arizona Radiation Regulatory Agency on licensing matters.
2. Serve as liaison between management and radiographers.
3. Develop and maintain up-to-date operating and emergency procedures.
4. Assume control and institute corrective action in emergency situations.
5. Investigate the cause of incidents and determine necessary preventative action.
6. Be responsible for source replacement.
7. Maintain exposure devices, storage facilities, fixed facilities, and equipment.
8. Establish and maintain the quarterly internal inspection program and quarterly inventory.
9. Procure and maintain an adequate number of operable and properly calibrated radiation survey instruments.
10. Establish and maintain the applicant's record-keeping system.
11. Establish and maintain the applicant's leak test program.
12. Establish and maintain a personnel monitoring program, and review exposures.
13. Establish and conduct a training program for radiographers and assistants.
14. Examine and determine competency of radiographic personnel.

_____ _____

SIGNATURE **DATE**

ATTACHMENT B

CALIBRATION OF SURVEY INSTRUMENTS

Radiation survey meters shall be calibrated with a radioactive source. Electronic calibrations are not acceptable.

1. The source shall approximate a point source.

2. The source activity or exposure rate at a given distances shall be traceable by documented measurements to a standard source certified within five percent accuracy to the U.S. National Institute of Standards and Technology (NIST) calibrations.

3. The frequency shall be at intervals not to exceed three months and after servicing. Battery changes are not considered “servicing”.

4. A source that has the same photon energy as the environment in which the calibrated device will be employed should be used for the calibration.

5. The exposure rate measured on the instrument scale shall differ from the true exposure rate by less than 20 percent at the point of measurement.

6. The source used must be of sufficient strength to give an exposure rate of 700 mR/hr at 20 cm. Minimum activities of typical sources are 85 mCi of Cs-137, 21 mCi of Co-60, and 34 mCi of Ra-226.

7. The inverse square law and the radioactive decay law must be used to correct for change in exposure rate due to changes in distance or source decay.

8. The following three kinds of scales are frequently used on survey meters:

   A. Meters on which the user selects a linear scale must be calibrated at no less than two points on each scale. The points should be at approximately 1/3 and 2/3 of full scale.

   B. Meters that have a multidecade logarithmic scale must be calibrated at no less than one point on each decade and no less than two points on one of the decades. Those points should be at approximately 1/3 and 2/3 of the decade.

   C. Meters that have an automatically ranging digital display device for indicating rates must be calibrated at no less than one point on each decade and at no less than two points on one of the decades. Those points should be at approximately 1/3 and 2/3 of the decade.

9. A record must be made of each survey meter calibration.

10. The report of a survey meter calibration should indicate the procedure used and the data obtained. The description of the calibration will include:

    A. The owner or user of the instrument.

    B. A description of the instrument that includes manufacturer, model number, serial number, and type of detector.

    C. A description of the calibration source, including exposure rate at a specified distance on specified date.

    D. For each calibration point, the calculated exposure rate, the indicated exposure rate, the deduced correction factor (the calculated exposure rate divided by the indicated exposure rate), and the scale selected on the instrument.

E. The angle between the radiation flux field and the detector (for external cylindrical GM or ionization-type detectors, this will usually by "parallel" or "perpendicular" indicating photons traveling either parallel with or perpendicular to the central axis of the detector; for instruments with internal detectors, this should be the angle between the flux field and a specified surface of the instrument).

F. For detectors with removable shielding, and indication of whether the shielding was in place or removed during the calibration procedure.

G. The name of the person who performed the calibration and the date on which the calibration was performed.

11. The following information will be attached to the instrument as a calibration sticker or tag:

A. The source that was used to calibrate the instrument.

B. For each scale or decade, one of the following as appropriate:

(1) The average correction factor; or

(2) A graph or graphs from which the correction factor for each scale or decade may be deduced.

C. The angle between the radiation flux and the detector during the calibration.

12. See Figure B-1 for a form which may be used. If a different form will be used, attach a copy to this Attachment when submitted with the application.

_____ _____

SIGNATURE **DATE**

FIGURE B-1

SURVEY METER CALIBRATION REPORT

OWNER: _____ DEPARTMENT: _____

MANUFACTURER: _____ TYPE: ☐ ION CHAMBER ☐ GM TUBE

☐ NaI (T1) (Scintillation)

☐ OTHER: _____

MODEL: _____ SERIAL NUMBER: _____

PROBE: _____ PROBE SERIAL NUMBER: _____

CALIBRATION SOURCE: _____ mCi of _____ or _____ mR/hr at _____ on _____

Manufacturer _____ Model _____

NIST Traceable ☐ Yes ☐ No

INSTRUMENT CHECKS: BATTERY CHECK: _____ mR/hr or _____

CONSTANCY CHECK: ☐ CHECK SOURCE INDICATES _____ mR/hr

☐ _____ of _____ INDICATES _____ mR/hr

CALIBRATION GEOMETRY:

_____

_____

_____

WINDOW: ☐ OPEN ☐ CLOSED ☐ FIXED

DIST	mR/hr	SCALE:		SCALE:		SCALE:	
(feet)	Today	Reading	CORFAC	Reading	CORFAC	Reading	CORFAC

CORRECTION FACTORS: _____ _____ _____

DIST	mR/hr	SCALE:		SCALE:		SCALE:	
(feet)	Today	Reading	CORFAC	Reading	CORFAC	Reading	CORFAC

CORRECTION FACTORS: _____ _____ _____

ATTACHMENT C

DAILY MAINTENANCE CHECK OF
RADIOGRAPHIC DEVICE AND RELATED EQUIPMENT

The radiographer will perform a daily maintenance check of the exposure device and related radiographic equipment. This inspection will be conducted prior to the use of the equipment on each day that radiographic work is to be performed. Report defective equipment to the RSO immediately. Do not attempt to use defective equipment. After determining that the equipment is operative, record the condition of the radiographic equipment. Inspection requirements are listed in A.A.C. R12-1-508.

Inspect remote-control radiographic equipment as follows:

- Inspect the cables for cuts, breaks, and broken fittings.

- Inspect the crank for damage and loose hardware.
- Check operation of controls for freedom of drive cable movement.
- Inspect the guide tube for cuts, crimps, and broken fittings.
- Survey for radiation levels and record readings. The radiation levels should be about the same as those in previous daily inspections.
- Ensure that all safety plugs are in place.
- Inspect the exposure device for damage to fittings, lock, fasteners, and labels.
- Check for any impairment of the locking mechanism.
- Record the results of the daily inspection in the log.

ATTACHMENT D

FIELD RADIOGRAPHY
INTERNAL INSPECTION CHECKLIST

Radiography Location _____ Date _____ Time _____
Radiographer _____ Inspector _____
Radionuclide _____ Activity _____ Serial Number _____
Projector Serial No. _____ Projector Make & Model No. _____
Survey Meter Model No. _____ Serial No. _____ Calibration Due Date _____

		YES	NO
1.	Are the radiographers and assistants wearing their film badge, personnel dosimeter, and alarming ratemeter? (R12-1-523)	☐	☐
2.	Are other individuals working within the restricted area wearing personnel monitoring equipment required in number 1 above?(R12-1-418)	☐	☐
3.	Is the restricted area posted with sufficient "CAUTION or DANGER) RADIATION AREA" signs? (R12-1-429) and (R12-1-532)	☐	☐
4.	Is the restricted area properly controlled to prevent unauthorized entry? (R12-1-531)	☐	☐
5.	Is the high radiation area posted with sufficient "CAUTION (or DANGER) HIGH RADIATION AREA" signs? (R12-1-429)	☐	☐
6.	Is there at least 1 calibrated and properly operating survey meter? (R12-1-504)	☐	☐
7.	Is the utilization log filled out properly? (R12-1-507)	☐	☐
8.	Do the radiographers and assistants have sufficient knowledge of safety rules? (Ascertained by oral questions.) (R12-1-521)	☐	☐
9.	Is the radiographic equipment defective? (R12-1-508)	☐	☐
10.	Does the radiographer or assistant survey the source projector and source tube. Do they take a radiation reading one foot in front of the source following the radiographic exposure? (R12-1-533)	☐	☐
11.	Are radiation sources stored properly and kept locked to prevent unauthorized removal? (R12-1-503)	☐	☐
12.	Is the storage area posted with "CAUTION (or DANGER) RADIOACTIVE MATERIAL" signs? (R12-1-429)	☐	☐
13.	Is there a copy of the applicant's operating and emergency procedures and license readily available? (R12-1-534)	☐	☐
14.	Do the radiographer and/or assistant know how to use a survey meter and make an accurate reading of the dose rates? (R12-1-521)	☐	☐
15.	Is proper visual surveillance of the restricted area maintained? (R12-1-531)	☐	☐
16.	Are there any items of noncompliance other than those listed on this form? (If any, explain in remarks.)	☐	☐
17.	**Increased Controls appear to be adequate? (As described in procedures)**	☐	☐

REMARKS: _____

ATTACHMENT E

TRAINING PROGRAM

An applicant for an industrial radiography license is required to have an adequate program for the training of radiographers. With respect to radiography personnel, two important points must be understood:

1. The duties and responsibilities of the radiographer may not be delegated to an assistant. A radiographer must by physically present at the location where radiography is being performed. A radiography assistant may perform source manipulation, surveys of the radiography device to determine source location, etc., only in the physical presence of the radiographer.

2. Any individual who assists a radiographer by manipulating radiographic exposure devices, sealed sources, related handling tools, or survey instruments is acting in the capacity of an assistant, and must meet the requirements of AAC R12-1-521.

The description of the complete training program must include the sequence of events in the training of a person to become a radiographer from the time of hiring through the time the job begins. Since AAC R12-1-521 lists the requirements for radiographers and radiography assistants, separate narratives pertaining to the training of radiographers must be submitted. In addition, a third narrative pertaining to the training of individuals who are hired with previous training and experience may be desirable. The narrative should include appropriate references to the more detailed description of each of the various parts of the training program described in accordance with the items identified below.

Full In-House Training Program

If the applicant desires a broad training program, the Agency must be provided with a narrative description of the complete training program. This narrative must cover the following items:

1. Initial Classroom Training

   A description of the manner in which each radiographer assistant will be instructed in all topics outlined in AAC R12-1-521 must be provided. It should include a detailed outline (more detailed than that in AAC R12-1-521) of the course content, including specification of the approximate time to be spent on each major area of instruction. Below is an example of the format of the outline that the Agency is looking for:

TOPIC	TIME
I. Fundamentals of Radiation Safety	
A. Characteristics of Radiation	5 hours
(1) The Atom	
(2) Isotope	
(3) Radioactive Decay	
(4) Kinds of Radiation	
(a) Alpha	
(b) Beta	
(c) Gamma	
(d) Neutron	
(5) Properties of Radiation	
(a) Energy	
(b) Ionization	

TOPIC	TIME
B. Units of Radiation and Quantity of Radioactivity	5 hours
(1) Activity	
(a) Curies	
(b) Millicuries	
(c) Decay curve	
(2) Radiation Dose	

The outline should reflect the material that will be presented in the course and the approximate times that will be spent on each subject. The times and subjects given above are not intended to be the optimum, but are merely used as an example.

If the initial classroom training is given by an outside consultant, or outside service organization, the training course will not usually instruct the assistant with respect to an applicant's particular equipment, facility and procedures. Therefore, if outside training is to be used, instruction given to supplement that training with respect to the applicant's own equipment, facilities and procedures, and the method to be used to determine each assistant's competence should be included in the program description. If an outside consultant or outside service organization will be used, the name of the organization should be specified. **Only outside consultants or outside service organizations that have specific authorization from the Agency, the U.S. Nuclear Regulatory Commission (NRC) or any other Agreement State to provide initial classroom training may be used.**

2. On-the-Job Training

A period of on-the-job training, including observation of an assistant's use of radiographic exposure devices and associated equipment by an instructor, should be described. The minimum time that will be spent and the content of on-the-job training should be specified. The instructor providing on-the-job training and supervising the assistant during this period may be a person other than the one providing the initial classroom training. However, this person must be specified in the program and a resume for each proposed instructor must be submitted to the Agency for authorization. These instructors should be the more experienced radiographers with a record of safe performance.

3. Periodic Refresher Training

This should include a description of the content and frequency of training sessions given for the purpose of ensuring:

A. The knowledge and proficiency of radiographers and instructors with respect to new rules, procedures, policies and equipment.

B. Continuing proficiency with present equipment and procedures.

It is expected that, as a minimum, periodic refresher training will be conducted at intervals not to exceed 12 months.

4. Testing Procedures

A description of each test to be given shall be submitted.

A written test is required for the initial classroom training. Written tests, oral examinations, demonstrations or a combination of all may be used for other phases of the training program.

A description of a written test may be given by submitting a sample test with the answer for each question.

The effectiveness of any test is reduced if given so repeatedly that the students gain knowledge of its content. Clearly indicate in the course description that each test is a sample only and that the test will be changed periodically at a stated minimum frequency.

Specify what is considered a passing grade, the relative importance assigned to each question or area of performance, and the retraining procedures for those questions missed to ensure that an assistant has a thorough understanding of all subjects outlined in AAC R12-1-521.

A description of an oral examination should be given in the same form as a written examination.

Practical or on-the-job demonstration examining procedures may be described in terms of the areas of performance to be checked by the examiner such as performance of radiation surveys, posting and operation of equipment.

The points within the training program at which each test will be given should be clearly indicated.

5. Instructor's Qualifications

A resume of training and experience of each instructor must be submitted to the Agency. If an individual teaches only certain parts of the course, this should be specified. Example: If a radiographer is chosen to provide on-the-job training, then this should be clearly stated in the application. The Agency reserves the right to evaluate instructors by administering examinations to them, attending their lectures, or administering examinations to individuals that have successfully completed their training courses. The person who makes the final determination of the adequacy of an assistant's knowledge and competency should have a strong background of training and experience with radiation of radiographic operations.

6. Records

Records must be maintained to demonstrate that an individual has received all the necessary instructions and on-the-job training prior to working as a radiographer. These records should include copies of tests given to each assistant, documentation of performance on oral and practical exams and the examiner's overall evaluation of the assistant's qualification to act as a radiographer.

Limited In-House Training Program

If an applicant does not have qualified personnel to present the initial classroom training, or if qualified personnel are available but do not have the time to devote to such an undertaking, the licensee may hire previously trained radiographers and provide the necessary on-the-job training, operating and emergency procedures instruction and necessary instructions in the use of radiographic equipment. In such a case, the narrative description of the training program should include the following items:

1. A description of the instruction that the individual will be given in the applicant's operating and emergency procedures.

2. A description of the instruction that will be given in the use of the applicant's authorized radiography and safety-related equipment.

3. A detailed description of the test that will be used to determine the individual's knowledge and understanding of the rules, the applicant's operating and emergency procedures, and the use of the applicant's equipment.

4. A period of on-the-job training, including observation of the assistant's use of radiographic devices and associated equipment by an instructor, should be described. See Full In-House Training Program, paragraph 2, for additional information concerning on-the-job training.

5. A description of the periodic refresher training that will be given. See Full In-House Training Program, paragraph 3, for additional information concerning refresher training.

6. Records must be maintained documenting that the individual has received the initial classroom training and that he has received the appropriate training in the applicant's operating and emergency procedures and use of equipment. In addition, copies of any examination given to the radiographer, either written or oral, must be maintained for inspection by the Agency.

7. Any instructors used in the program must meet the requirements as outlined in Full In-House Training Program, paragraph 5, and resumes submitted as described.

Very Limited In-House Training Program

In cases where the radiography company is very small or does not have the personnel to provide appropriate training, or in cases where the radiography program is limited to a few individuals and personnel turnover is not anticipated, a training program may not be necessary, provided each individual has adequate training and experience. The qualifications of each individual requested as a radiographer should be submitted along with documentation that the individual has received instruction in the use of authorized equipment and the applicant's operating and emergency procedures. **Do not forget to submit a proof of certification for all radiographers.**

Even if the applicant does not have a formal training program, periodic refresher training must be provided and a description of this periodic refresher training must be submitted for Agency review. For additional details concerning this item, refer to Full In-House Training, paragraph 3.

ATTACHMENT F

LEGAL STRUCTURE OF THE APPLICANT

8. **LEGAL STRUCTURE OF APPLICANT**

An Individual ☐ A Partnership ☐ A Limited Liability Corporation ☐ A Corporation ☐

An Unincorporated Association ☐ City/County/State Government ☐

A Partnership

Please provide the name and address of each individual or legal entity owning a partnership interest in the applicant.

Please state the percentage ownership of the applicant partnership held by each of the individuals or legal entities listed above.

A Limited Liability Corporation

Memberships Ownerships

A Corporation

STOCK OF APPLICANT CORPORATION

# AUTHORIZED SHARES TOTAL SUBSCIBERS	# ISSUED SHARES	# SUBSCRIBED SHARES	TOTAL STOCKHOLDERS

Is the applicant corporation directly or indirectly controlled by another corporation or other legal entity?
If "yes" give name and address of other corporation or legal entity and describe how such control exists and the extent of control.

For all entities, please identify the State, District, or Territory under the laws of which the applicant is organized. Include the name and address of any Arizona agent for the applicant.

9. The applicant or any official executing this application on behalf of the applicant certifies that this application has been prepared in accordance with Arizona Administrative Code, Title 12, Chapter 1, and all information contained on this form, including any supplements and attachments, is true and correct to the best of his or her knowledge and belief.

DATE _____ APPLICANT (ITEM 1) _____ BY _____ (TITLE) _____

ATTACHMENT G

SHIPPING PAPER

SHIPPER: _____

ADDRESS: _____

_____

HAZARDOUS MATERIAL

PROPER SHIPPING NAME: RADIOACTIVE MATERIAL**,** SPECIAL FORM, N.O.S.

HAZARD CLASS: 7

IDENTIFICATION NUMBER: UN2916 RQ

TRANSPORT LABEL: _____

TRANSPORT INDEX: _____

DEVICE	MODEL	QUANTITY	ISOTOPE	ACTIVITY

LABEL APPLIED: _____

PACKAGE SPECIFICATION NUMBER:

THIS IS TO CERTIFY: THAT THE ABOVE-NAMED MATERIAL(S) ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED, LABELED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE STATE OF ARIZONA AND U.S. D.O.T.

SHIPPER SIGNATURE: _____

TITLE: _____

IN CASE OF AN EMERGENCY, CONTACT THE FOLLOWING:

Department of Public Safety Duty Officer at: (602) 223-2212

ATTACHMENT H

INCREASED CONTROLS

The following areas must be discussed in a description of the applicants Increased Controls program. The program will be inspected by the Agency before radiography operations are allowed to begin.

1. How is access to the radiography sources controlled?
   A. At the office location
   B. In the field
2. Will unescorted access to the sources be allowed?
3. How is trustworthy and reliability determined, including employees and vendors?
4. How will radiation sources be monitored? Include detection, assessing, and responding to unauthorized access to the stored sources.
5. Will you be able to provide immediate response to all situations?
6. Has a response arrangement been made with the local law enforcement agency?
7. Is Agency notification included in the response plan?
8. Describe the records management system for documenting all program actions.
9. Describe the control plan for interfacing with third party carriers.
10. How is the carrier meeting their obligations for ensuring increased controls?
11. Will increased control shipments be made outside of normal licensed activities?
12. Describe the two independent physical barriers that will prevent unauthorized removal of radioactive material during transport to and from job-sites.
13. Can the vehicle be disabled during transport? If so, describe.
14. An applicant must commit to keeping records of the increased control program for three years. Included are employee trustworthy and reliability, carrier information, and shipment information.
15. The applicant must commit to protecting sensitive information. How will this requirement be accomplished? Will the applicant limit access to certain person? Describe the limitations.
16. **Individuals having access to the radioactive material must be fingerprinted. Please describe your plan in your Increased Controls program.**

*As a reminder, the application for license will not be approved until an adequate increased control program has been demonstrated to the Agency.

Additional information

The Agency's licensing person has additional information on preparing an adequate Increased Control program. Should there be additional questions contact this person or see the following:

1. Using "Google" access the NRC web-site by entering NRC "increased control."
2. For additional regulatory information see the December 1, 2005, *Federal Register* (Vol. 70, No.230, pages 72128-72132.