
RADIOACTIVE MATERIALS PROGRAM
GUIDE APPLICATION FOR INDUSTRIAL RADIOGRAPHY

State of Georgia Radioactive Materials Program Rev/Date 4/2007 REVISION 2
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****PLEASE 1ST CONTACT THE DEPARTMENT AT (404) 362-2675 FOR CURRENT REQUIREMENTS FOR INCREASED CONTROLS****

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**GEORGIA DEPARTMENT OF NATURAL RESOURCES
RADIOACTIVE MATERIALS PROGRAM**

LICENSING GUIDE FOR INDUSTRIAL RADIOGRAPHY

I. PURPOSE OF GUIDE

This guide describes the information needed by the Georgia Radioactive Materials Program to assist applicants and licensees in preparing applications for new licenses, license amendments, and license renewals for the performance of industrial radiography. Radiography, as used in this guide, means " the examination of the structure of materials by nondestructive methods, utilizing sealed sources of radioactive material." The radionuclides most commonly used for radiography are cobalt 60 and iridium 192. This guide should not be considered as an all inclusive and complete substitution for understanding of the Regulations, training in radiation safety or developing and implementing an effective Radiation Protection Program.

After you are issued a license, you must conduct your program in accordance with (1) the statements, representations, and procedures contained in your application, (2) the terms and conditions of the license, and (3) the following Department of Natural Resources' (Department) Regulations.

1. **Rule 391-3-17-.02**, " Licensing of Radioactive Materials. Amended."
2. **Rule 391-3-17-.03**, " Standards for Protection Against Radiation. Amended."
3. **Rule 391-3-17-.04**, " Special Radiation Safety Requirements for Industrial Radiographic Operations. Amended."
4. **Rule 391-3-17-.06**, " Transportation of Radioactive Materials. Amended."
5. **Rule 391-3-17-.07**, " Notice, Instructions and Reports to Workers; Inspections. Amended."

Unless stated otherwise, all regulations cited in this guide are in Chapter 391-3-17, "Rules and Regulation for Radioactive Materials". You may request copies of the above documents from the Department at: **4220 International Parkway, Atlanta Tradeport, Suite 100, Atlanta, Georgia, 30354, or from the World Wide Web at <http://www.gaepd.org/Documents/rmprogram1.html>.**

AS LOW AS IS REASONABLY ACHIEVABLE (ALARA) PHILOSOPHY

Rule .03 (4)(b) states, "The licensee shall use, to the extent practical, procedures and engineering controls based upon sound radiation protection principles to achieve occupational doses and doses to members of the public that are as low as is reasonably achievable (ALARA)." As an applicant, you must have an ALARA plan that embraces this philosophy when developing plans for working with radioactive materials.

This Radiation Protection Program must be reviewed at least annually for the effectiveness of implementation. Licensees are required to maintain records of their Radiation Protection Program

until the Department terminates the pertinent license. The Licensee must maintain records of audits and other reviews of Program content and implementation for 3 years after the record is made.

II. FILING AN APPLICATION

Complete the form "Application for a Radioactive Materials License" (Appendix A). Complete Items 1 through 4 on the form itself. For Items 5 through 13, submit the information on supplementary pages. Each separate sheet or document submitted with the application needs to be identified and keyed to the item number on the application to which it refers. All typed pages, sketches, or drawings should be on 8-1/2 X 11 inch paper to facilitate handling and review. Complete all items in enough detail for the Department to determine that your equipment, facilities, training and experience, and Radiation Protection Program are adequate to protect health and to minimize danger to life and property.

All license applications and documents submitted to the Department will be available for review by the general public. Do not submit proprietary information unless it is absolutely necessary for the Department to use for evaluation of your application. The Department may withhold any document or part of a document from public inspection if disclosure of its contents is not required by law.¹ Any request for withholding is subject to a determination by the State of Georgia as to whether the document may actually be withheld in accordance with applicable laws and regulations.

Personal information about employees should not be submitted unless it is necessary. For example, the training and experience of employees need to be submitted to demonstrate their ability to manage radiation safety programs and to work safely with radioactive materials. Home addresses, home telephone numbers, dates of birth, social security numbers, and radiation dose information should not be submitted unless the Department specifically request it.

Prepare the application and supplements in duplicate. Submit the original copy to the Radioactive Materials Program where it becomes a part of the license if approved and keep an exact copy for your records. Mail license applications, amendment, renewal requests, and terminations of license, **along with a copy of the fee payment to expedite the licensing process**, to the **Radioactive Materials Program, 4220 International Parkway, Atlanta Tradeport, Suite 100, Atlanta, Georgia, 30354.**

III. CONTENTS OF AN APPLICATION

Item 1. LICENSE INFORMATION

Indicate whether this is an application for a new license, an amendment, or a renewal. If this is an amendment or a renewal, please identify the license number and business name. An amendment request may be submitted in a letter form without using the application. In all cases, the appropriate license fee must accompany the application in order for the review to

¹A copy of the Georgia Open Records Law is available from the Georgia Law Library, for the cost of the photocopy. The telephone number for the library is (404) 656-3468.

begin. See Appendix D for the correct fee.

Item 2.A. NAME AND MAILING ADDRESS OF APPLICANT

Enter the applicant's name, mailing address, county, telephone number, facsimile number, and Internet address if applicable. The applicant should be the legal name of the corporation or other legal entity with direct control over the use of the radioactive material. If the applicant is an individual, the individual should be acting in a private capacity and the use of the radioactive material should not be connected to the individual's employment in a corporation or other legal entity. The mailing address does not have to be a Georgia address.

Item 2.B. STREET ADDRESS(ES) OF USE

List each permanent facility used as a location of storage of the cameras by the street address, city, and state or other descriptive address (such as on Highway 2 miles east of the intersection of Highway 10 and State Route 234, AnyTown, State). The descriptive address should be sufficient to allow a Department inspector to find the location; access to the cameras must be available to the Department "at all reasonable times" (Rule .01(5)(a)). A Post Office Box is not acceptable for Item 2.B. **The storage address must be in the State of Georgia.**

If the device will be used at a permanent facility or facilities, give the specific address of each. Please identify the latitude and longitude coordinates of your facility(s), if you can provide this information. If you will conduct operations at temporary job-sites, you should specify "temporary job-sites" in the State of Georgia.

Item 3. PERSON TO CONTACT

Enter the name, and telephone number, and email address of the individual(s) responsible for this application and license. This individual should be familiar with the proposed radioactive materials program and be able to answer questions about the application. This individual is usually the person responsible for the Radiation Protection Program and will serve as the point of contact during the review of the application and after issuance of the license. Notify the Department if the individual assigned this function changes. Changing the contact person **does not require amending the license** unless the individual is the Radiation Safety Officer.

The individual named in Item 3 may or may not be the individual who signs the application in Item 13 on behalf of the applicant and who has the authority to make and implement commitments to the Department. However, any commitments made by the applicant must be signed by the individual named in Item 13 as only that individual is considered by the Department to have authority to make commitments on behalf of the applicant.

Item 4. RECORD LOCATION

Indicate where records are to be maintained. Records must be maintained in Georgia and be available for Department inspection "upon reasonable notice" (Rule .01(5)(b)). If temporary job-sites or multiple locations are being requested, records required a temporary job-site must be maintained at that site until the completion of that job.

Item 5. RADIOACTIVE MATERIAL

The manufacturer and model number of the source must be keyed to the manufacturer and model number of the exposure device. Consult the proposed supplier for this information to ensure that the sources, devices, and their combinations conform to the sealed source and device designations registered with the U. S. NRC or an Agreement State. Equipment identified improperly may require additional correspondence with the Department and could slow the review process.

If source changers will be used, the source changers should be identified by the manufacturer and model number and should be keyed to the source device combinations with which they will be used.

If sources are to be used for instrument calibration or daily instrument checks and are not the same sources which will be used for performance of radiography, specific information concerning manufacturer, model number, and quantity of radioactive material should be specified.

All radiographic exposure devices and associated equipment used after January 10, 1996, shall comply with the requirements of Rule .04(5). The licensee shall maintain records to verify compliance with the Department Regulations.

Note: Sources that exceed 200 Curies of iridium-192 and 100 Curies of cobalt-60 will not be routinely approved for temporary job-site use, because of the large area that requires surveillance. Sources that exceed these amounts should be used in shielded permanent facilities. If you wish to use sources in excess of 100 Curies of cobalt-60 or 200 Curies of iridium-192 at temporary job-sites, you should provide specific information concerning where the sources will be used, the conditions of use, and how you will conduct surveillance to prevent entry into the restricted area. Your operating and emergency procedures (see Item 10 of this guide) should provide special instructions governing the use of such sources with particular emphasis on area surveillance.

NOTE New requirement Increased Controls:

The U.S. Nuclear Regulatory Commission (NRC) and the Agreement States have implemented increased controls for licensees that possess certain radioactive materials in quantities of concern. NRC has determined that additional requirements need to be implemented to supplement existing regulatory requirements in 10 CFR 20.1801-1802 (rules similar to Rule Chapter 391-3-17-.03(11)(a) and (b)). The increased controls are a matter of compatibility with NRC and must be implemented with essentially identical content to those being used by NRC for its licensees. To determine whether this is applicable to your application, **please refer to Appendix F for a list of radionuclides with Quantities of Concern.**

Item 6. PURPOSES FOR WHICH LICENSED MATERIAL WILL BE USED

Specify the purposes for which the industrial radiography cameras/source exchangers you want to possess will be used. The industrial radiography cameras/source exchangers were designed for specific use and shall be used in accordance with the manufacturer's recommendations.

Item 7. INDIVIDUAL RESPONSIBLE FOR RADIATION PROTECTION PROGRAM AND HIS TRAINING AND EXPERIENCE

Active control over the radiography program must be exercised by management personnel in positions of authority. The radiography applicant must submit a description of the overall organizational structure pertaining to the radiography program, including specific delegations of authority and responsibility for the program.

Each individual in the line of authority should be identified by name and their duties and responsibilities relating to the radiography program should be described in detail. The training and experience of each individual which qualifies them to perform their duties and accept their responsibilities should also be described.

Those individuals in management who will be assigned duties established by the licensee for maintaining an active management control of the program should be identified.

The following list describes duties which may be performed by the licensee's management personnel. The individual(s) assigned these duties may bear the title of Radiation Safety Officer (RSO), radiation protection officer, or some similar designation. The list is not intended to be all inclusive nor should it be interpreted as a requirement that any person assume all of the listed duties. Specific information pertaining to your program should be submitted.

The specified duties of the RSO include, but are not limited to, the following:

1. To establish and oversee operating, emergency, and ALARA procedures, and to review them regularly to ensure that the procedures are current and conform with Department Rules and Regulations;
2. To oversee and approve all phases of the training program for radiographic personnel so that appropriate and effective radiation protection practices are taught, including observing the performance of radiography personnel during actual industrial radiographic operations at intervals not to exceed 6 months;
3. To ensure that required radiation surveys and leak-tests are performed and documented in accordance with these Rules, including any corrective measures when levels of radiation exceed established limits;
4. To ensure that personnel monitoring devices are calibrated and used properly by occupationally-exposed personnel, that records are kept of the monitoring results, and that notifications are timely;
5. To ensure that any required interlock switches and warning signals are functioning and that radiation signs, ropes, and barriers are properly posted and positioned;
6. To investigate and report to the Department each known or suspected case of an individual's radiation exposure in excess of limits, a detected radiation level in excess of limits, and any theft or loss of source(s) of radiation; and to determine the cause and to take steps to prevent recurrence;
7. To have a thorough knowledge of management policies and administrative procedures of the licensee;

8. To assume control and have the authority to institute corrective actions, including the shutdown of operations when necessary in emergency situations or unsafe conditions;
9. To maintain required records;
10. To ensure the proper storing, labeling, transport, and use of exposure devices and sources of radiation;
11. To ensure that inventory, inspection, and maintenance programs are performed in accordance with Rule .04; and
12. To ensure that personnel are complying with the Rules and Regulations, the conditions of the license, and the operating and emergency procedures of the licensee.

An RSO shall be designated on every industrial radiography license issued by the Department.

The RSO's qualifications shall be submitted to the Department and must include: completion of the radiographer's training and testing requirements in Rule .04(16); 2000 hours of hands-on experience as a trained radiographer, and formal training in the establishment and maintenance of a Radiation Protection Program.

Item 8. TRAINING PROGRAM FOR INDUSTRIAL RADIOGRAPHY PERSONNEL; PERIODIC RETRAINING

"Radiographer" is defined as any individual who performs, or who in attendance at the site where radioactive materials are being used personally supervises, industrial radiographic operations and who is responsible to the licensee for assuring compliance with the requirements of this Chapter and all license conditions.

"Radiographer's Assistant" is defined as any individual who, under the direct supervision of a radiographer, uses radiographic exposure devices, radioactive materials, related handling tools, or radiation survey instruments in industrial radiography.

An applicant for a radiography license must have an adequate program for the training of their radiography personnel. Even if initial radiation safety training is provided by an outside entity, the licensee must have an in-house training program to provide the necessary training for radiographers and radiographer's assistants in the operating and emergency procedures and use of equipment. Training requirements are found in Rule .04(16).

The applicant should provide a description of the program for training radiographers and assistants. The applicant should also provide further information concerning requirements for permitting individuals to act as radiographers or assistants. In the training program description include the sequence of events from the time of hiring through the designation of individuals as radiographer trainees and radiographers. In addition, differentiate between the training and examination given to individuals with no previous training and experience and that given to individuals with previous training and experience.

Note: Radiographers must be certified to conduct industrial radiography in the State of Georgia. The Radioactive Materials Program offers the Industrial Radiography Examination

for radioactive materials; contact the Program for more information and to enroll for the next Examination.

1. Initial Training:

Provide an outline of the initial orientation training and instruction to be given to prospective individuals with previous experience and/or training.

2. Formal Forty-Hour Training Course:

- (a) Provide an outline of the course given. The course should include all topics in Rule .04(16)(g).
- (b) Specify the time to be spent on each topic.
- (c) Identify the course segments by title and instructor if they are to be conducted by guest speakers or instructors outside your organization.
- (d) Identify those topics not covered by a course, outside of your organization, such as your license conditions, operating and emergency procedures, the use and hazards of your radiography equipment and the time spent by your instructor on the identified topics.
- (e) A copy of textbook and references to be used must be submitted to the Department.
- (f) Submit a copy of a typical examination together with the correct answers to the examination questions. Indicate the passing grade and describe the reinstruction to be given in areas in which individuals are found to be deficient.

The "Comprehensive Forty-Hour Course Examination" should contain approximately 50 questions covering all items in Rule .04(16)(g).

3. Field Examination:

Provide a description of the field (practical) examination that will be given to prospective radiographers. The examination should be a practical demonstration of knowledge and ability to perform radiography and related tasks in compliance with your operating and emergency procedures and the Department's regulatory requirements.

A list of subject areas for the field examination should be given and should include, as a minimum, performance of radiation surveys, posting, operating and emergency procedures, operations of equipment, and other items of radiation safety that may be encountered in the discharge of duties.

The comprehensive field examination should contain a minimum of 25 questions covering the applicant's operating and emergency procedures and the use of radiographic equipment would be considered to be an adequate examination to qualify individuals as a radiographer.

4. On-the-Job Training:

Specify the period of on-the-job training under the supervision of an experienced radiographer, including use and observation of the use of radiographic exposure devices and associated equipment. However, no individual should be permitted to enter into on-the-job training until completing the requirements for a radiographer's assistant. The content of on-the-job training and the minimum time that will be spent in it will be dictated by the applicant's scope of operation, the

variety of the work, and the aptitude of the trainee, and should be specified in the application.

5. Previously-Trained Individuals:

Because of differences in procedures, equipment, etc., it is unlikely that a new employee will be adequately prepared to work in a particular program without some training specifically related to that program. Also, each licensee is required by (16)(a) and (c) of Rule .04 to determine that each individual is qualified to act as a radiographer or radiographer's assistant in its own program. The applicant should therefore describe the procedure for determining the knowledge and competency of individuals and for providing additional training if needed.

6. Periodic Training:

Periodic training should include a description of the content and scheduling of the training session given for the purpose of ensuring (a) the knowledge and proficiency of radiographers and radiographer's assistants with respect to new regulations, procedures, policies, and equipment and (b) continuing proficiency with present equipment and procedures. Refresher safety training must be conducted at least annually. If a radiographer or assistant has not participated in an industrial radiographic operation for more than 6 months since his last job-performance inspection, he must demonstrate knowledge of the training requirements of Rule .04(16)(b)3 (radiographers) or of (16)(c)3 (assistants) before he can next participate in a such an operation.

7. Records

The licensee is required to maintain for 3 years records of training, annual refresher training, and semi-annual inspections of job performance for each radiographer and radiographer's assistant.

Item 9. FACILITIES AND EQUIPMENT

The Department will not authorize permanent storage of radiographic exposure devices, source changers, or transport containers that contain radioactive material in areas zoned as residential.

Please describe the permanent storage facility for radioactive material. This description should include the following:

1. A description of the storage vault including a drawing with dimensions and shielding details. Survey information, if available, should be supplied.
2. A description of **general** security measures provided to prevent unauthorized removal of, or access to, devices containing radioactive material. **Detailed security measures should not be submitted except in accordance with Appendix E, and should not be given to anyone without a Need To Know.**
3. A description of the building in which the storage vault is located, its relationship to other buildings in the area (especially to occupied office areas) and a description of the security

provided by the building to prevent any unauthorized entry into the storage vault.

4. Posting of the vault and the storage area.

In addition to the permanent storage facility, please provide a description of the precautions that will be taken for storage of material at temporary job-sites. This should include the following:

1. A description of the storage vault or container that is provided on transporting vehicles, including dimensions and shielding information.
2. Posting of temporary storage facilities.
3. Precautions that will be taken to prevent unauthorized removal of radioactive material from temporary storage facilities.

If a permanent, shielded facility will be used for performance of radiography, a detailed description of the facility should be submitted which includes the following:

1. Annotated drawings or sketches of the facility and its surroundings, including:
 - (a) dimensions of each enclosed area
 - (b) thickness, density, and type of shielding material on all sides, and below
 - (c) identification of entrance ways, and (d) a description of the nature of, and distances to, all areas adjacent to, above, and below each exposure area.
2. A description of **general** security measures provided to prevent unauthorized removal of, or access to, radioactive material. Particular attention should be given to the description of the high radiation area entrance controls that are required by Rule .04(12). **Detailed security measures should not be submitted except in accordance with Appendix E, and should not be given to anyone without a Need To Know.**
3. Each entrance that is used for personnel access to the high radiation area in a permanent radiographic installation must have both visible and audible warning signals to warn of the presence of radiation. The visible signal must be activated by radiation whenever the source is exposed. The audible signal must be actuated when an attempt is made to enter the installation while the source is exposed.
4. The control device or alarm system shall be tested for proper operation at the beginning of each day of use. Records of such tests shall be maintained for inspection by the Department until it authorizes their disposal.

The objective of a shielded facility is to permit performance of radiography within the facility so that areas outside of the facility may be considered unrestricted areas and will meet the radiation level limitations in of Rule .03(5)(i).

Item 10. RADIATION PROTECTION PROGRAM

The applicant for a license to use industrial radiography sources is required to develop a comprehensive Radiation Protection Program to ensure the safety of the general public and its employees. The following is intended only for general guidance in the preparation of the license application and should not be considered a substitute for the applicant's careful safety evaluation of the proposed use of sealed sources and devices.

Each licensee is required to provide radiography personnel with operating and emergency procedures. The procedures must contain at a minimum those listed in Rule .04(17). The purpose of these procedures is to provide radiography personnel with clear and specific instructions in specific topics and other duties and responsibilities which radiography personnel may have. Other duties could include instrument calibration, leak-testing, 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 radiography personnel -- for example, description of training program, 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 equipment manuals and other publications should be extracted and placed into the operating and emergency procedures so that the instructions to personnel are clear, specific, and appropriate for the proposed program. The instructions contained in the operating and emergency procedures should be in language which can be easily understood by radiography personnel.

There is no specific format for operating and emergency procedures. A sequential set of instructions which covers radiography operations from the beginning of the work day to the end of the workday is an acceptable format.

The topics below should be included in the operating and emergency procedures, and the comments following them should be of help:

1. Handling and Use of Licensed Sealed Sources, 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 should be provided. When appropriate, the procedures should include instructions for use of radiation collimating cones or their auxiliary shielding material.

If source exchanges will be performed by radiography personnel, the procedures should include step- by-step instructions for the source exchange, including surveys to be performed during the source exchange and for shipment, and the acceptable radiation levels for the surveys.

If radiography personnel will perform instrument calibration, the procedures should include step-by-step instructions, also detailing radiation safety precautions.

2. Methods and Occasions for Conducting Radiation Surveys

The procedures should identify when surveys shall be made, specifically what should be surveyed, and acceptable radiation levels for the survey.

In general, a survey should be performed each time a source is manipulated or moved. Surveys which need to be performed include:

- (a) Determination after each exposure that the source has returned to the safe storage position. This survey should include both the guide tube, if appropriate, and the device itself.
- (b) Determination of the perimeter of the restricted area.
- (c) Determination of radiation levels at external surfaces of storage facilities.
- (d) Determination of radiation levels in and around vehicles used for transporting sources and devices.
- (e) Determination that the source is in a safe storage position prior to securing a radiographic exposure device or storage container.
- (f) Determination that containers prepared for shipment comply with the requirements in Department of Transportation regulations. (The "Yellow II" label means maximum radiation levels are 1.0 mR/hr at 3 feet from any surface of the package and 50.0 mR/hr at the surface of the package. Packages of higher levels require a "Yellow III" label.)

The acceptable radiation levels for surveys should be expressed in milliroentgens per hour. Radiation levels should not be expressed in terms of potential dose.

3. Methods for Controlling Access to Radiographic Areas

Instructions for controlling access to radiographic areas should be specifically stated in the procedures.

The perimeter of the restricted area and the perimeter of the high radiation must be posted. "Caution (or Danger) - Radiation Area" signs should be posted at the perimeter of the restricted area and "Caution (or Danger) - High Radiation Area" signs should be posted at the perimeter of the high radiation area. The use of high radiation area signs are not acceptable for use at the perimeter of the restricted area; these signs should be used only at the perimeter of the high radiation area. Signs, by themselves, do not provide an adequate means of access control. For 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. For permanently established facilities, specific instructions concerning use of inter-locking 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 site operations.

A specification of a radiation level of 2 mR/hr for the perimeter of the restricted area and 100 mR/hr for the perimeter of the high radiation area is acceptable. A physical survey with a survey

meter should be performed to confirm the 2 mR/hr radiation level for the restricted area after the source has been exposed. It is neither necessary nor desirable for physical survey to be made to confirm the radiation level at the perimeter of the high radiation area since such a survey could lead to unnecessary exposure of personnel.

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

Instructions and procedures for storage of sources and devices at both permanent and temporary job sites, including posting of storage areas and surveys around the storage areas, should be in the procedures. The licensee should have two independent, physical controls (see page 40) to prevent theft and unauthorized access to the sources and devices. The area outside storage areas should be considered an unrestricted area.

5. Personnel Monitoring and the Use of Personnel Monitoring Equipment

The instructions should contain requirements for radiography personnel to wear their personnel monitoring devices so that any exposure received will be accurately reflected by the devices. The instructions should be specific.

Frequent reading of pocket dosimeters should be required so that personnel may be aware of exposure which they may have received. An instruction concerning steps which must be taken immediately by radiography personnel in the event a dosimeter is found to be off-scale should be in the procedures. This instruction should include the requirement stated in Rule .04(19)(d) that an individual's film badge, thermoluminescent dosimeter (TLD), optically-stimulated luminescence dosimeter (OSL), or other such device be processed immediately if that individual's pocket dosimeter is discharged beyond its range. Instructions for storage of personnel monitoring devices should be in the procedures.

The name of the supplier of the film badge, TLD, OSL, or other dosimeter should be identified. The frequency of exchange of the dosimeters should be specified.

The manufacturer, model number, and range of pocket dosimeters to be used should be identified. Procedures for checking pocket dosimeter exposures and energy response should be described.

The manufacturer and model number of alarm ratemeters to be used should be identified. Procedures for checking alarm ratemeter's alarm signal at a preset dose-rate of 500 mR/hr as required by Rule .04(19)(g) should be described.

6. Transporting Sealed Sources to Field Locations, Packaging of Exposure Devices and Storage Containers, Posting of Vehicles, and Control of Sealed Sources During Transportation

The transport over public roads of radiography sources in exposure devices or storage containers is subject to the regulations of the U.S. Department of Transportation. These regulations cover, among other things, permissible radiation levels around and within a vehicle and placarding of the vehicle during transport. In those cases in which the U.S. Department of Transportation regulations are not applicable, such as intrastate transportation, Rule .06 does require conformance to the standards and requirements of the U.S. Department of Transportation.

The procedures should contain instructions on how exposure devices or storage containers should be secured within the transporting vehicle to prevent shifting within the vehicle. There should be instructions for placarding of the vehicle during transport. The DOT regulations require "RADIOACTIVE" placards on all 4 sides of the vehicle if the device or container ("package") needs a "Yellow III" label. There should be instructions for surveys in and around the vehicles. For the passenger compartment, the radiation level should not exceed 2 milliroentgens per hour. Although not specifically required for transport, there are occasions when the vehicle may be used for storage and the area outside the vehicle must be considered an unrestricted area so that a specification of a radiation level of 2 milliroentgens per hour at a distance of 18 inches from any external surface of the vehicle should be provided.

When a vehicle is used for storage, the posting requirements in Rule .03 are applicable. Therefore, a vehicle when used for storage should be posted with "Caution - Radioactive Material" signs. As noted above, the area outside a parked vehicle used for storage is an unrestricted area and the radiation level at the surface of the vehicle should not exceed 2 milliroentgens per hour at 18 inches from the surface of the vehicle.

7. Minimizing Exposure of Persons in the Event of an Accident

Instructions to personnel should include procedures for minimization of exposure to persons in the event of an accident or other unusual occurrence. Possible malfunctions of equipment should be considered and steps to follow in each case of malfunction should be specifically set forth.

The procedures should contain clear and specific instructions concerning emergency situations. The steps to be taken by radiography personnel should, in general, be limited to (a) surveying the area, (b) establishing a restricted area, (c) notifying appropriate persons, and (d) maintaining direct surveillance and control over the area until the situation is corrected. Limitations on action 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, and operation that may result in exposure to high levels of radiation, should not normally be attempted by radiography personnel without qualified help.

8. The Procedure for Notifying Proper Persons in the Event of an Accident

The names and telephone numbers of the persons to be contacted in case of an accident should be specified.

9. Record -Keeping

The instructions to personnel should specify those records which must be maintained by them during the course of their work. Among those records which are normally made by radiography personnel are dosimeter readings, surveys, and daily inspection of equipment. Other records should be included if they are the responsibility of radiography personnel.

Records for which management and supervisory personnel have responsibility should not be included in the operating and emergency procedures.

10. Inspection and Maintenance of Radiography Exposure Devices, Storage Containers and Source Changers

Rule .04(11)(a) requires a check for obvious defects in radiographic equipment prior to each day the equipment is used. The procedures should contain specific instructions for inspection of equipment and the actions to be taken if any defects are found.

A check-list should be contained in the procedures concerning the items which should be covered in the daily inspection. Equipment manufacturers may be helpful in providing information concerning daily inspections.

Quarterly inspection and preventive maintenance of equipment must be carried out. If radiography personnel will conduct these inspections, clear and specific instructions for inspection and maintenance should be in the procedures. As part of the inspection and preventive maintenance program, all connectors, drive cables, source guide tubes, on-off indicator mechanisms, and all 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. If components essential to the safe operation of the device are found to be defective, or in poor operating condition, the device should be immediately removed from service until repairs can be made. Instructions for performance of such inspections should be in the procedures if they are performed by radiography personnel.

11. Off-Scale Pocket Dosimeter Readings

Procedures to be taken immediately by radiography personnel in the event a pocket dosimeter is found to be off-scale should include the following instructions:

- (a) Stop work immediately.
- (b) Initiate emergency procedures if the source is exposed and cannot be retracted; otherwise, retract the source safely to a shielded position.
- (c) Notify the Radiation Safety Officer immediately. In this regard the name of the radiation safety officer and the manner in which this individual can be reached should be included.

12. Product Malfunctions and Defects

If the radiographer discovers any malfunction or defect in the equipment, the radiographer should notify the Radiation Safety Officer. Procedures to be followed in such an event should tell the radiographer what to report, when to report the problem, and the individual to whom it should be reported.

13. General Instrumentation

Instruments should be identified by manufacturer, model number, and range of instrument. For instruments to be used for surveys, the instruments must have a capability of measuring a minimum of two milliroentgens per hour through one Roentgen.

Rule .04(8)(b) requires that radiation survey instruments used in radiographic operations be calibrated at intervals not to exceed 6 months and after each instrument servicing. See Appendix C for items in a calibration program.

If an applicant wishes to calibrate their instruments, the following information should be submitted:

- (a) The type (radioisotope, manufacturer, model number) and activity of source to be used (NIST-traceable).
- (b) The specific procedures to be used for calibration including radiation safety procedures to be followed for use of the source.
- (c) The name and pertinent experience of each individual who will perform instrument calibration.

If instrument calibration will be performed by an organization other than the applicant, the following information should be included in the application.

- (a) The name and address of the organization.
- (b) A description of its calibration procedures.
- (c) A copy of the data and certificate of calibration which will be furnished to the applicant.

14. Leak-Tests

Distributors of sealed sources usually supply a certificate with each source giving the results and date of the last leak-test performed on a source. If such a certificate is not received, the source is not to be used until a leak-test has been performed and the results of the test received showing that the source is not leaking or contaminated. Thereafter, the source must be tested for leakage and contamination at intervals not to exceed six months. Records of the testing of each source, identifying the source tested, the date of the test, and the results of the test in units of microcuries, must be maintained for Department inspection.

The leak-testing of sealed sources may be performed only by persons who are specifically authorized by the Department, another Agreement State, or the U.S. Nuclear Regulatory Commission to do so. In establishing a program for leak-testing, you may choose one of three approaches:

- (a) You may utilize the services of a consultant or commercial organization licensed by the Department, another Agreement State, or the U.S. Nuclear Regulatory Commission to take the necessary test samples ("smears"), evaluate the samples, and report the results to the customer. The name, address, and license number of the consultant or commercial organization should be specified in your application.
- (b) You may be licensed by the Department to use a commercially available leak-test kit to take smears of the cameras yourself and then send them to a licensed organization to be analyzed. Your application should specifically identify each kit you may wish to use by

listing the kit supplier and model number. Only those leak-test kits which are specifically identified will be authorized. Your application should identify the individuals who will perform the leak-test, using the kit. Specific instructions for leak-testing should be included in the operating and emergency procedures for personnel; instructions and procedures provided by leak-test kit suppliers may need to be modified to fit your 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 should be informed, as dealing with suppliers is usually a management function.

- (c) You may be licensed by the Department to perform your own-leak tests, including taking and evaluating the smears. Should you desire to conduct your own leak-tests, you should submit the information required by Rule .04 (4)(h). This should include a description of the instrumentation to be used in evaluating the smear, including its sensitivity and accuracy, and a description of your 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 may not be acceptable for this use. A description of the material to be used in taking the smears, the points on the equipment which will be smeared (smears are not normally taken directly from the surface of a source -- see Rule .04(9)(c)), the radiation safety procedures to be followed during the smearing process, the method for handling and disposing of the smears and the training and experience of each person who will take or evaluate the smears which qualifies him for each task should also be included. Again, specific instructions should be contained in the operating and emergency procedures.

15. Picking Up, Receiving, and Opening Packages:

Rule.03(12)(f) contains requirements for picking up, receiving, and opening packages. The application should include a description of procedures for the expeditious and timely acceptance of shipments containing more than 20 Curies of a radioactive source in special form. The application should also include provisions for the monitoring of packages for external radiation levels, maintaining records of such surveys, and notifying the Department if surface radiation levels in excess of 200 mR/hr or at three feet radiation levels in excess of 10 mR/hr are found.

16. Internal Inspection System or Other Management Control:

The application should include a description of the system for controlling the receipt, possession, and use of radioactive material. The system should assure that license conditions, Georgia regulations, and operating and emergency procedures are followed by radiography personnel. The applicant should submit a description of their internal inspection system or other management control.

This should include a description of:

- (a) the qualifications of each person responsible for maintaining such control.
- (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.
- (e) the education and follow-up program to be utilized in correcting deficiencies noted during

inspections. The type and extent of the radiography program to be conducted will usually determine the nature of the system and the inspection frequency.

Item 11. WASTE MANAGEMENT

Because of the nature of the licensed material contained in devices, your only option for disposal is to transfer the material to an authorized recipient. Authorized recipients are the original supplier of the device, a commercial firm licensed by the Department, the U.S. NRC or an Agreement State to accept radioactive waste from other persons, or another specific licensee authorized to possess the licensed material (i.e., whose license specifically authorizes possession of the source and radiographic exposure device by manufacturers' names and model numbers or similar designation). No one else is authorized to receive and dispose of licensed material.

Before transferring radioactive material, you must verify that the recipient is properly authorized to receive it by using one of the methods described in Rule .02(19)(d). In addition, you must package and ship the material in accordance with the Department and DOT regulations, and you must maintain records of the transfer. It is acceptable to state in Item 11 of your "Application For Radioactive Materials License" Form that "disposal of the radioactive material will be its transfer to persons who are specifically licensed to receive and possess it."

Item 12. LICENSE FEES

The applicant should refer to the DNR Radioactive Materials License Fee Schedule (Appendix D) to determine the appropriate amount. (Note that, in addition to licensing fees, licensees are required to pay annual and possibly other fees.) No action will be taken on applications filed without the proper fee. Checks for the fees should be made payable to the **Department of Natural Resources, Radioactive Materials Program**, and mailed to the following address:

Radioactive Materials Fees
P.O. Box 101161
Atlanta, Georgia 30392

Note: Prior approval from the Department must be obtained before Small Entity classification can be used.

Mail license applications, amendment requests, renewal requests, and requests for license terminations, **along with a copy of the appropriate fee payment to expedite the licensing process**, to the following address:

Radioactive Materials Program
4220 International Parkway
Atlanta Tradeport, Suite 100
Atlanta, Georgia 30354

Item 13. **CERTIFICATION**

If you are an individual applicant acting in a private capacity, you must sign the completed application form. Otherwise, the application should be dated and signed by a representative of the applicant corporation or legal entity -- a representative who is authorized to make binding commitments and to sign official documents on behalf of the applicant, and who must certify that the application contains information that is true and correct to the best of the signer's knowledge and belief. Unsigned applications will not be reviewed and will be returned for proper signature.

IV. **AMENDMENTS TO A LICENSE**

After you are issued a license, you must conduct your program in accordance with: the statements, representations, and procedures contained in your application and other correspondence with the Department; the terms and conditions of the license; and Department regulations.

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

An application for a license amendment may be prepared either on the application form, Appendix A, or in a letter, and should be prepared in duplicate as stated in Section II of this guide. Retain one copy, as the license requires that you possess and use licensed material in accordance with the statements and representations in your amendment request and in any supplements to it.

Your application should state your license number and clearly describe the exact nature of the changes, additions, or deletions. References to previously submitted information and documents should be clear and specific and identify the pertinent information by date, page, and paragraph. For example, if you wish to change the RSO, your application for a license amendment should specify the proposed RSO's name, training, and experience. The qualifications of the proposed RSO should be equivalent to those specified in Item 7 of this guide.

The Department will not issue the amendment prior to receipt of the proper fee as specified in the Fee Schedule, Appendix D.

V. **RENEWAL OF A LICENSE**

Licenses are issued for a period of up to 5 years. In accordance with Rule .02(15), you must apply for a renewal of the license at least thirty (30) days prior to its expiration date. Send the application for renewal to the address specified in Section 2 of this guide. Retain a full copy of all of the application documents as the license requires that you possess and use licensed material in accordance with the statements and representations in your renewal request and in any

supplements to it.

You may submit an entirely new application for renewal as if it were an application for a new license without referring to information submitted previously. This is the preferred method of renewing a license, especially for those whose licenses refer to a large number of documents or old documents. Submitting an entirely new application allows you to re-evaluate your program periodically and to consolidate the description of your program into one or two up-to-date documents. A new application ensures that your program contains all needed information as requested in current licensing guidance.

As an alternative to a new application, you may:

1. Review your current license to determine whether the information about sealed sources and radiographic exposure devices/source changer devices accurately represents your current and anticipated program. Identify any necessary additions, deletions, or other changes and then prepare information appropriate for the required additions or changes.
2. Review the documents submitted to the Department in the past to determine whether the information is up-to-date and accurately represents your facilities, equipment, personnel, radiation safety procedures, locations of use, etc. The documents considered to represent your current program must be identified by date. Also identify any out-of-date and superseded documents and indicate the changes in them that are necessary to reflect your current program.
3. Review current Department regulations to ensure that any changes in the regulations are appropriately covered in your program description.
4. After you have completed your review, copy any past documents that are still valid, **giving them the current date**, and submit them with any new data along with a letter to the Department requesting renewal of your license. Again, please retain full copies of all letters and documents for your records.
5. Include the name and telephone number of the person to be contacted about your renewal application, and include a current mailing address if it is not indicated correctly on your license.

If you file your application for license renewal at least 30 days before the expiration date of your license, your present license will automatically remain in effect until the Department takes final action on your renewal application. However, if you file an application less than 30 days before the expiration date and the Department cannot process it before that date, you will be without a valid license when your license expires.

If you do not wish to renew your license, dispose of all licensed radioactive material possessed in a manner authorized by 391-3-17-.02(19). Complete the Department's form, "Request to Terminate Radioactive Materials License", Appendix B, and send it to the Department before the

expiration date of your license with a request that your license be terminated.

If you cannot dispose of all the licensed radioactive material in your possession before the expiration date, you must request a license renewal. Department regulations do not allow possession of licensed material without a valid license.

There are no fees required for renewals or terminations.

VI. TERMINATION OF A LICENSE

You may request termination of your license at any time. This requires neither a license amendment nor any fee. The request should include the completed Department's form (or all of the information listed thereon), "Request to Terminate Radioactive Materials License", Appendix B, certifying that all sources have been disposed of properly. Note that a license is not terminated until the Department takes action to terminate the license. **An application for license termination does not relieve the licensee from its obligations to comply with Department Regulations and the terms and conditions of the license.**

APPENDIX B

**GEORGIA DEPARTMENT OF NATURAL RESOURCES
RADIOACTIVE MATERIALS PROGRAM**

REQUEST TO TERMINATE RADIOACTIVE MATERIALS LICENSE

1. Licensee _____ 2. License Number _____
3. Address _____ Zip Code _____
4. Request is hereby made that the Radioactive Material License described above be terminated for the following reason:

5. Radioactive Material possessed under this license has been disposed of as indicated below:

- Material was used for the licensed purposes, none remains.
 Material was leased, and has been returned to lessor.
 Material has been transferred to the following licensee:

No.	Name	License
_____	_____	_____
	Address	Zip Code
	_____	_____

- Material has been disposed of in the following manner:

6. Signature

(a) If Licensee is in name of Institution,
Responsible official must sign below

(b) If Licensee is in name of Individuals,
Radiation Safety Officer must sign below

Official

Radiation Safety Officer

Keep one copy for your records and send one copy to:

GEORGIA DEPARTMENT OF NATURAL RESOURCES
RADIOACTIVE MATERIALS PROGRAM
4220 INTERNATIONAL PARKWAY, SUITE 100
ATLANTA, GEORGIA 30354

APPENDIX C

CALIBRATION OF SURVEY METERS

Calibration of survey meters should be performed with radionuclide sources* that approximate point sources. The source activities should be traceable within $\pm 5\%$ accuracy to the National Institute of Standards and Technology (NIST).

Note: The small check source that is incorporated into some survey meters is not appropriate nor acceptable for calibration purposes.

1. The licensee shall maintain sufficient calibrated and operable radiation survey instruments to make physical radiation surveys as required by Rules .03 and .04. Instrumentation required herein shall have a range such that 2 milliroentgens per hour through one Roentgen per hour can be measured.
2. Each radiation survey instrument shall be calibrated:
 - (a) By a person licensed or certified by the Department, another Agreement State, or the U.S. Nuclear Regulatory Commission to perform such service;
 - (b) At energies appropriate for the licensee's use;
 - (c) At intervals not to exceed 6 months and after each instrument servicing;
 - (d) To demonstrate an accuracy within ± 20 percent ; and
 - (e) At two points located approximately $1/3$ and $2/3$ of full-scale on each scale for linear scale instruments; at midrange of each decade, and at two points of at least one decade for logarithmic scale instruments; and at approximate points for digital instruments.
3. Records shall be maintained of these calibrations for 3 years after the calibration date for inspection by the Department.
4. Each radiation survey instrument shall be checked with a radiation source at the beginning of each day of use and at the beginning of each work shift to ensure the survey instrument is operating properly.
5. The inverse square law and radioactive decay law may be used for calibration. A calibrated source will have a calibration certificate giving its output at a given distance measured on a specified date by the manufacturer. The inverse square law may be used with any point source to calculate the exposure rate at other distances. The radioactive decay law may be used to calculate the output at any time after the specified source calibration date.

*Sources of cesium 137, or cobalt 60 are appropriate for use in calibrations. The activity of the calibration standard should be sufficient to calibrate the survey meters on all ranges up to one roentgen per hour. If there are higher ranges, they should at least be checked for operation and approximately correct response to radiation.

(a) Inverse Square Law

If R_a is the exposure rate at a distance D_a from a point source and R_b is the exposure rate at a distance D_b from the same point source, then

$$R_a(D_a)^2 = R_b(D_b)^2$$

Note: R_a and R_b must be in the same units of exposure rate (e.g., mR/hour, R/hour, etc.) and D_a and D_b must be in the same units of distance (e.g., centimeters, meters, etc.).

If R_a , D_a , and D_b are known, R_b can be calculated from

$$\frac{R_a(D_a)^2}{(D_b)^2} = R_b$$

(b) Radioactive Decay Law

The exposure rate (R_t) of a standard source at a time (t) after a specified calibration date is given by:

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

where R_t is the exposure rate at a time t after the source calibration date, R_o is the exposure rate on the day of calibration t is the time elapsed since the calibration date, and $T_{1/2}$ is the radionuclide half-life.

Note: R_t and R_o must be in the same units of exposure rate (e.g., mR/hour, R/hour, etc.) and t and $T_{1/2}$ must be in the same units of time (e.g., seconds, days, years, etc.).

APPENDIX D

FEE SCHEDULE

Category	Non-Routine Inspection	Application	Amendment	Exam	Annual Fee		
					Nominal	Small Entity	Lower Tier
C.2 – Inhouse Industrial Radiography	\$2500	\$3000	\$490	\$80	\$4160	\$2160	\$1695
C.3 - Multiple Industrial Radiography Job-Sites	\$2500	\$3000	\$490	\$80	\$4160	\$2160	\$1695

APPENDIX E

INCREASED CONTROLS

****PLEASE 1ST CONTACT THE DEPARTMENT AT (404) 362-2675 FOR CURRENT REQUIREMENTS FOR INCREASED CONTROLS****

The following two documents contain the latest information, as of the writing of this guide, concerning increased controls that the U. S. Nuclear Regulatory Commission has issued to the State of Georgia. Appendix F replaces the U. S. Nuclear Regulatory Commission's table containing the Radionuclides of Concern.

INCREASED CONTROLS FOR LICENSEES THAT POSSESS SOURCES CONTAINING RADIOACTIVE MATERIAL QUANTITIES OF CONCERN

The purpose of the increased controls (IC) for radioactive sources is to enhance control of radioactive material in quantities greater than or equal to values described in Table 1 (of Appendix F), to reduce the risk of unauthorized use of radioactive materials, through access controls to aid prevention, and prompt detection, assessment, and response to mitigate potentially high consequences that would be detrimental to public health and safety. These increased controls for radioactive sources are established to delineate licensee responsibility to maintain control of licensed material and secure it from unauthorized removal or access. The following increased controls apply to licensees which, at any given time, possess radioactive sources greater than or equal to the quantities of concern of radioactive material defined in Table 1 (of Appendix F).

- IC 1. In order to ensure the safe handling, use, and control of licensed material in use and in storage each licensee shall control access at all times to radioactive material quantities of concern and devices containing such radioactive material (devices), and limit access to such radioactive material and devices to only approved individuals who require access to perform their duties.
- a. The licensee shall allow only trustworthy and reliable individuals, approved in writing by the licensee, to have unescorted access to radioactive material quantities of concern and devices. The licensee shall approve for unescorted access only those individuals with job duties that require access to such radioactive material and devices. Personnel who require access to such radioactive material and devices to perform a job duty, but who are not approved by the licensee for unescorted access, must be escorted by an approved individual.
 - b. For individuals employed by the licensee for three years or less, and for non-licensee personnel, such as physicians, physicists, house-keeping personnel, and security personnel under contract, trustworthiness and reliability shall be determined, at a minimum, by verifying employment history, education, and personal references. The licensee shall also, to the extent possible, obtain independent information to corroborate that provided by the employee (i.e., seeking references not supplied by the individual). For individuals employed by the licensee for longer than three years, trustworthiness and reliability shall be determined, at a minimum, by a review of the employees' employment history with the licensee.
 - c. Service providers shall be escorted unless determined to be trustworthy and reliable by an NRC-required background investigation as an employee of a manufacturing and distribution (M&D) licensee. Written verification attesting to or certifying the person's trustworthiness and reliability shall be obtained from the manufacturing and distribution licensee providing the service.
 - d. The licensee shall document the basis for concluding that there is reasonable assurance that an individual granted unescorted access is trustworthy and reliable, and does not constitute an unreasonable risk for unauthorized use of radioactive material quantities of concern. The licensee shall maintain a list of persons approved for unescorted access to such radioactive material and devices by the licensee.
- IC 2. In order to ensure the safe handling, use, and control of licensed material in use and in storage, each licensee shall have a documented program to monitor and immediately detect, assess, and respond to unauthorized access to radioactive material quantities of concern and devices. Enhanced monitoring shall be provided during periods of source delivery or shipment, where the delivery or shipment exceeds 100 times the Table 1 values in Appendix F.

- a. The licensee shall respond immediately to any actual or attempted theft, sabotage, or diversion of such radioactive material or of the devices. The response shall include requesting assistance from a Local Law Enforcement Agency (LLEA).
- b. The licensee shall have a pre-arranged plan with LLEA for assistance in response to an actual or attempted theft, sabotage, or diversion of such radioactive material or of the devices which is consistent in scope and timing with a realistic potential vulnerability of the sources containing such radioactive material. The pre-arranged plan shall be updated when changes to the facility design or operation affect the potential vulnerability of the sources. Pre-arranged LLEA coordination is not required for temporary job-sites.
- c. The licensee shall have a dependable means to transmit information between, and among, the various components used to detect and identify an unauthorized intrusion, to inform the assessor, and to summon the appropriate responder.
- d. After initiating appropriate response to any actual or attempted theft, sabotage, or diversion of radioactive material or of the devices, the licensee shall, as promptly as possible, notify NRC Operations Center at (301) 816-5100 or, for Agreement State licensees, the appropriate Agreement State regulatory agency [Georgia: (404) 362-2675 for business hours, (404) 656-4865 or 1-800-241-4113 for 24-hour Radiological Assistance].
- e. The licensee shall maintain documentation describing each instance of unauthorized access and any necessary corrective actions to prevent future instances of unauthorized access.

IC 3. a. In order to ensure the safe handling, use, and control of licensed material in transportation for domestic highway and rail shipments by a carrier other than the licensee, for quantities that equal or exceed those in Table 1 of Appendix F but are less than 100 times Table 1 quantities, per consignment, the licensee shall:

- 1. Use carriers which:
 - A. Use package tracking systems,
 - B. Implement methods to assure trustworthiness and reliability of drivers,
 - C. Maintain constant control and/or surveillance during transit, and
 - D. Have the capability for immediate communication to summon appropriate response or assistance.

The licensee shall verify and document that the carrier employs the measures listed above.

- 2. Contact the recipient to coordinate the expected arrival time of the shipment;
- 3. Confirm receipt of the shipment; and

4. Initiate an investigation to determine the location of the licensed material if the shipment does not arrive on or about the expected arrival time. When, through the course of the investigation, it is determined the shipment has become lost, stolen, or missing, the licensee shall immediately notify the NRC Operations Center at (301) 816-5100 or, for Agreement State licensees, the appropriate Agreement State regulatory agency [Georgia: (404) 362-2675 for business hours, (404) 656-4865 or 1-800-241-4113 for 24-hour Radiological Assistance]. If, after 24 hours of investigating, the location of the material still cannot be determined, the radioactive material shall be deemed missing and the licensee shall immediately notify the NRC Operations Center or, for Agreement State licensees, the appropriate Agreement State regulatory agency.
- b. For domestic highway and rail shipments, prior to shipping licensed radioactive material that exceeds 100 times the quantities in Table 1 of Appendix F per consignment, the licensee shall:
 1. Notify the NRC¹, in writing, at least 90 days prior to the anticipated date of shipment. The NRC will issue the Order to implement the Additional Security Measures (ASMs) for the transportation of Radioactive Material Quantities of Concern (RAM QC). The licensee shall not ship this material until the ASMs for the transportation of RAM QC are implemented or the licensee is notified otherwise, in writing, by NRC.
 2. Once the licensee has implemented the ASMs for the transportation of RAM QC, the notification requirements of 3.b.1 shall not apply to future shipments of licensed radioactive material that exceeds 100 times the Table 1 quantities of Appendix F. The licensee shall implement the ASMs for the transportation of RAM QC.
 - c. If a licensee employs an M&D licensee to take possession at the licensee's location of the licensed radioactive material and ship it under its M&D license, the requirements of 3.a and 3.b above shall not apply.
 - d. If the licensee is to receive radioactive material greater than or equal to the Table 1 quantities in Appendix F, per consignment, the licensee shall coordinate with the originating licensee to:
 1. Establish an expected time of delivery; and
 2. Confirm receipt of transferred radioactive material. If the material is not received at the expected time of delivery, notify the originating licensee and assist in any investigation.
- IC 4. In order to ensure the safe handling, use, and control of licensed material in use and in storage, each licensee that possesses mobile or portable devices containing radioactive material in quantities greater than or equal to Table 1 values in Appendix F shall:
- a. For portable devices, have two independent physical controls that form tangible barriers to secure the material from unauthorized removal when the device is not under direct control and constant surveillance by the licensee.

¹Director, Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

- b. For mobile devices:
 - 1. that are only moved outside of the facility (e.g., on a trailer), have two independent physical controls that form tangible barriers to secure the material from unauthorized removal when the device is not under direct control and constant surveillance by the licensee.
 - 2. that are only moved inside a facility, have a physical control that forms a tangible barrier to secure the material from unauthorized movement or removal when the device is not under direct control and constant surveillance by the licensee.
- c. For devices in or on a vehicle or trailer, licensees shall also utilize a method to disable the vehicle or trailer when not under direct control and constant surveillance by the licensee.

IC 5. The licensee shall retain documentation required by these increased controls for three years after they are no longer effective:

- a. The licensee shall retain documentation regarding the trustworthiness and reliability of individual employees for three years after the individual's employment ends.
- b. Each time the licensee revises the list of approved persons required by 1.d, or the documented program required by 2, the licensee shall retain the previous documentation for three years after the revision.
- c. The licensee shall retain documentation on each radioactive material carrier or three years after the licensee discontinues use of that particular carrier.
- d. The licensee shall retain documentation on shipment coordination, notifications, and investigations for three years after the shipment or investigation is completed.
- e. After the license is terminated or amended to reduce possession limits below the quantities of concern, the licensee shall retain all documentation required by these increased controls for three years.

IC 6. Detailed information generated by the licensee that describes the physical protection of radioactive material quantities of concern, is sensitive information and shall be protected from unauthorized disclosure.

- a. The licensee shall control access to its physical protection information to those persons who have an established need to know the information, and are considered to be trustworthy and reliable.
- b. The licensee shall develop, maintain and implement policies and procedures for controlling access to, and for proper handling and protection against unauthorized disclosure of, its physical protection information for radioactive material covered by these requirements. The policies and procedures shall include the following:
 - 1. General performance requirement that each person who produces, receives, or acquires the licensee's sensitive information, protect the information from unauthorized disclosure,
 - 2. Protection of sensitive information during use, storage, and transit,
 - 3. Preparation, identification or marking, and transmission,

4. Access controls,
5. Destruction of documents,
6. Use of automatic data processing systems, and
7. Removal from the licensee's sensitive information category.

IMPLEMENTING GUIDANCE FOR LICENSEES THAT POSSESS RADIOACTIVE MATERIAL QUANTITIES OF CONCERN

Access Control

The objective is to limit “access” to radioactive material quantities of concern and devices containing radioactive material quantities of concern (devices) so that the risk of theft, sabotage, or unauthorized use is minimized. Access means that an individual could exercise some physical control over the material or device. These access control requirements supplement existing regulations that address security and control of radioactive material by further limiting unescorted access to only those individuals approved by the licensee.

If access to radioactive material quantities of concern or the device is required by an individual who has not been approved for unescorted access, the non-approved individual must be escorted by an approved individual. Escorting means maintaining line of sight with the escorted individual. Licensees should also establish a means by which individuals approved for unescorted access can be visually distinguished from those requiring escort. For example, those approved for unescorted access to radioactive material quantities of concern or the device could wear specially colored badges or other identifying articles. This may assist facility personnel in early detection of unauthorized access to radioactive material quantities of concern or the device.

Control of access to radioactive material quantities of concern and the device can be achieved by the following examples:

- Limiting distribution of keys, keycards, or combinations to doors and gates to approved individuals;
- Remote activation of locked doors and gates using remote surveillance;
- Using a card reader and electronic locking devices at control points; and
- Constant surveillance by a person approved for unescorted access.

These requirements also apply at temporary job-sites. Additionally, when transporting radioactive material quantities of concern, including the device, to and from a temporary job-site, access control shall be maintained when the transport vehicle is stopped at a hotel, restaurant, gas station, or other location.

Detection and Assessment

The licensee shall have a documented program to immediately detect unauthorized access to material when it occurs, assess whether the unauthorized access was an actual or attempted theft, and if so, initiate appropriate response. The objective is to reduce the risk that the material will be stolen and used for unauthorized purposes, and improve the opportunity for recovery if stolen.

In order to facilitate the immediate detection, assessment and response, the radioactive material quantities of concern and devices containing such material shall be monitored to detect unauthorized access. Monitoring may be accomplished by a variety of means, including:

- a monitored intrusion alarm (an intrusion detection system with the capability to detect unauthorized access and that is linked to an on-site or off-site central monitoring facility);
- electronic devices for intrusion detection (alarms that will alert nearby facility personnel); or
- visual monitoring (video surveillance cameras, and/or visual inspection by trained personnel).

Systems used to control access to high radiation areas as required by 10 CFR Part 20, or equivalent Agreement State Regulations, or other detection and access control systems used for radiation protection may be used or modified, provided the modifications do not compromise the original safety purpose. Documentation should describe how these systems provide the required intrusion detection.

The licensee is responsible for enhanced monitoring during source delivery and shipment when the delivery or shipment exceeds 100 times the Table 1 values. Some examples of enhanced monitoring are providing additional personnel to monitor the radioactive material or increasing video surveillance of the radioactive material. When a service provider takes temporary possession of a source at a licensed facility, during these activities, the licensee, not the service provider, is responsible for the enhanced monitoring as well as the other requirements.

The licensee shall establish a program for assessing and responding to unauthorized access so that prompt mitigating measures can begin. Assessment can be by either automated devices or trained personnel who can initiate the appropriate response. Licensees should consider the possibility of simultaneous alarms at multiple locations. The program's documentation shall describe the processes as to how the licensee would assess and respond to unauthorized access.

These requirements also apply at temporary job-sites. Additionally, when transporting radioactive material quantities of concern to and from a temporary job-site, detection and assessment capability shall be maintained when the transport vehicle is stopped at a hotel, restaurant, gas station, or other location.

In the event of any actual or attempted theft, sabotage, or diversion of radioactive material quantities of concern or the device, the licensee shall notify the local law enforcement agency (LLEA) immediately, followed soon thereafter by a call to the NRC Operations Center at (301) 816-5100, or, for Agreement State licensees, the appropriate Agreement State regulatory agency. Telephone calls to notify the NRC or State regulatory agencies should be as prompt as possible, but not at the expense of causing delay or interfering with LLEA response to the event.

Licensees shall have a pre-arranged plan with the LLEA that will respond to an actual or attempted theft of radioactive material quantities of concern or the device. One of the purposes of establishing liaison with the LLEA is to provide them with an understanding of the potential consequences associated with theft or sabotage of the radioactive material of concern so that the LLEA can appropriately determine the priority of its response. Licensees should inform the LLEA of the quantities of radioactive material that may be involved and the potential hazards associated with loss of control of the material. The licensee should also provide any facility information important to preplanning for an event response, establish licensee points of contact for recovery plans and radiation protection education, and work with the LLEA to develop a plan for a timely response. Licensees should determine, with the LLEA, the preferred method for contacting them to assure a timely response. The plan shall be consistent in scope and timing with realistic potential vulnerability of sources containing radioactive material quantities of concern (i.e., greater quantities require a faster response time and more response personnel. The pre-arranged plan shall be updated when changes to the facility design or operation affect the potential vulnerability of the sources.

A pre-arranged plan with the LLEA is not required at temporary job-sites. However, licensees must still meet the requirements of IC 2.a by immediately requesting assistance from the appropriate LLEA with jurisdiction for the area, of any actual or attempted theft, sabotage, or diversion of radioactive material quantities of concern or the device. When making a notification to the LLEA at a temporary job-site, provide the LLEA with the quantities of radioactive material involved and the potential hazards associated with loss of control of the material.

As required by IC 2.c, it is necessary that the licensee have a dependable means to transmit information to the various components involved in the detection and assessment of an intrusion, including with the appropriate responder. Land line phones, auto dialers, cellular phones, pagers, radios, and other similar modes of communication may be used to fulfill this requirement. Using a radio or cellular phone as a backup to land line phones should be considered. When more than one person is used for detection and assessment, a means of communicating among the various monitoring personnel shall be provided.

Licensees shall establish written procedures for responding to events ranging from an inadvertent unauthorized access that would not require an LLEA response, to a malevolent intrusion that would require intervention by LLEA. These procedures should include provisions for immediate response, after-hours notification, handling of each type of emergency, events at temporary job-sites, and the appropriate roles of the licensee's staff. The licensee staff should have a clear understanding of their responsibilities and limitations in an emergency, along with step-by-step instructions and clear guidelines for whom to contact. Note, when developing enhanced control measures, the licensee should not compromise facility operational safety, occupational safety, fire safety, and emergency planning at the facility. Implementation of enhanced control measures should enhance safety.

Licensees should amend their training program for employees to include the licensee's procedures for implementing these requirements. Training should address the access control system employed and notification procedures in the event of an unauthorized access and potential malevolent activities. It should also include the process for reporting any suspicious activities to management.

Coordination of Radioactive Material Shipments

The objective of these requirements is to ensure timely detection of any loss or diversion of shipments containing radioactive material quantities of concern so that the licensee can initiate an appropriate investigation and response.

When shipping quantities of radioactive material equal to or greater than the Table 1 values in Appendix F, per consignment, by a carrier other than by the licensee, the licensee shall seek reasonable assurance the carrier meets each of the requirements of IC 3.a. If the carrier has a tracking and security plan that the U.S. Department of Transportation requires for shipments of highway route quantities of radioactive material, the licensee shall verify and document that the carrier's tracking and security plan meets each of the requirements of IC 3.a, or obtain written confirmation that the carrier will implement these provisions.

As required by IC 3.b, licensees shall notify the NRC, in writing, 90 days before the anticipated date of shipment of radioactive material that exceeds 100 times the Table 1 quantities in Appendix F, per consignment. The NRC has Additional Security Measures (ASMs) for transportation of Radioactive Material in Quantities of Concern (RAM QC) which the Commission has determined are Safeguards Information - Modified Handling (SGI-M). SGI-M must be protected from unauthorized disclosure and no person may have access to SGI-M unless the person has an established need to know for the information. SGI-M related to the transportation of RAM QC must be protected in accordance with the Commission's November 5, 2004, order imposing SGI-M handling requirements on such information. That order can be found in the Federal Register at 69 Fed. Reg. 65470 (November 12, 2004). Because this group of licensees is not expected to be regularly shipping RAM QC, the NRC does not intend to release this SGI-M to licensees unless there is a demonstrated need to know. When a licensee notifies the NRC that it intends to ship such material, the NRC would then issue an additional Order for the transportation ASMs. Unless notified otherwise, in writing, by the NRC, licensees shall not ship the material before implementing the RAM QC transportation ASMs.

Once the licensee has implemented the ASMs, the licensee shall be exempt from the notification requirements of IC 3.b for future shipments of radioactive material above Table 1 quantities, per consignment. However, the licensee is not exempt from other transportation reporting requirements. The licensee shall implement the additional controls for all future shipments of radioactive material above Table 1 quantities, per consignment.

If a manufacturer and distributor (M&D) licensee takes possession of the radioactive material at the shipper's facility and ships the radioactive material under its M&D license, or implements the Transportation RAM QC ASMs for the shipping licensee, the licensee subject to this requirement shall be exempt from the requirements in IC 3.a and IC 3.b.

When the licensee transports licensed radioactive material quantities of concern (e.g., to and from a temporary job-site), the requirements of IC 1 and IC 2 shall be met.

Physical Barriers

Due to ease of movement, mobile and portable devices are particularly vulnerable to attempted theft or diversion; it may be possible for a mobile device to be removed before the licensee has an opportunity to respond to an intrusion. The objective of this requirement, therefore, is to delay an unauthorized entity long enough to provide additional time for the licensee and the LLEA to respond. This requirement requires licensees to have two independent physical controls that form tangible barriers to prevent unauthorized removal of mobile devices that are intended to be moved outside the facility (e.g., that are on trailers) and portable devices containing radioactive material quantities of concern that are not in use.

Examples of two independent physical controls at a licensed facility are:

- storage inside a locked storage shed within a secured outdoor area, such as a fenced parking area with a locked gate; or
- storage in a room with a locked door within a secured building for which access is controlled by lock and key or by a security guard; or
- storage inside a locked, non-portable cabinet inside a room with a locked door if the building is not secured.

Examples of two independent physical controls when securing the radioactive material quantities of concern in or on a transportation vehicle are:

- stored in a box physically attached to a vehicle, and the box is secured with two independent locks; two separate chains or steel cables that are locked and attached independently to the vehicle in such a manner that the box cannot be opened without the removal of the chains or cables; or
- stored in a box in a locked trunk, camper shell, van, or other similar enclosure and is physically secured to the vehicle by a locked chain or steel cable in such a manner that one would not be able to open the box and remove the portable or mobile device without removal of the chain or cable.

Examples of two independent physical controls when at a temporary job-site or at locations other than a licensed facility or licensee's vehicle, are:

- stored inside a locked building, in a locked non-portable structure (e.g., construction trailer, sea container, etc.), or in a locked garage, and is physically secured by a locked chain or steel cable to a non-portable structure in such a manner that an individual would not be able to remove the device without removing the chain or cable. A source must be inside a locked, non-portable cabinet or locked box that is secured to a non-portable structure.
- stored in a locked garage, and is within a locked vehicle or is physically secured by a locked chain or steel cable to the vehicle in such a manner that an individual would not be able to remove the device without removing the chain or cable.

For devices in or on a vehicle or trailer, licensees shall also utilize a method to disable the vehicle or trailer when not under direct control and constant surveillance by the licensee. Examples of acceptable methods include: trailer hitch locks, wheel locks (“boots”), or methods to disable the vehicle’s engine.

For mobile devices that are used inside a facility, additional delay may be accomplished by a variety of physical controls, including:

- speed bumps on floor too large for device to traverse ;
- elevated doorway thresholds;
- protective storage enclosures;
- channels in floor large enough to catch the device wheels;
- wheel locks (made of hardened material) that require key or special tool to release; or
- a hardened chain and lock that cannot be easily cut.

The additional physical controls should not compromise safety. If improperly implemented, some of the suggested items may compromise occupational safety.

Information Protection

The information generated by licensees which must be protected is information about its physical protection (security and controls) for radioactive material of concern, and includes but is not limited to: information describing how the radioactive material is secured from unauthorized removal or access when it is in storage, information describing how the licensee controls and maintains constant surveillance of the radioactive material when not in storage, information describing specific policies and procedures for actions taken by the licensee in response to the increased controls, and the details of the enhancements implemented for the radioactive material covered under this requirement. Such information is referred to as “sensitive information.”

The following discussion provides guidance licensees should follow to ensure compliance with the information protection requirements for IC 6:

- (1) The licensee’s policies and procedures must include general performance requirement that each person who produces, receives, or acquires the licensee’s sensitive information to ensure that such information is protected against unauthorized disclosure.

Dissemination of licensee’s sensitive information is limited to individuals who have an established need-to-know and who are trustworthy and reliable. Other than those individuals authorized by the licensee, members of certain occupational groups may be deemed trustworthy and reliable by virtue of their employment status. These occupational groups are:

1. An employee, agent, or contractor of the Commission, or the United States Government;
2. A member of a duly authorized committee of the Congress;

3. The Governor of a State or his designated representative;
4. A representative of the International Atomic Energy Agency (IAEA) engaged in activities associated with the U.S./IAEA Safeguards Agreement who has been certified by the NRC;
5. A member of a state or local law enforcement authority that is responsible for responding to requests for assistance during security emergencies; or
6. A person to whom disclosure is ordered pursuant to Section 2.709(f) of Part 2 of Part 10 of the Code of Federal Regulations; or
7. State Radiation Control Program Directors (and State Homeland Security Directors) or their designees.

If there is any indication that the recipient would be unwilling or unable to provide proper protection for the licensee's sensitive information they should not be authorized to receive it.

(2) The licensee's policies and procedures must address how to protect sensitive information while in use, storage, and transit.

The licensee should store the information in a locked cabinet, desk, office, etc. Information stored in non-removable electronic form should be password protected. Licensees need to address how employees need to protect the sensitive information while in their possession both at and away from the office. Access to the keys, combinations, passwords or other means used to secure the information needs to be limited to those persons authorized.

(3) The licensee's policies and procedures must address the preparation, identification or marking, and transmission of documents or correspondence containing the licensee's sensitive information.

The licensee generated sensitive information should be marked in such a manner to assure easy identification and to ensure proper handling. The front and back of folders containing sensitive information should be marked for easy identification and to ensure proper handling.

Documents that do not in themselves contain sensitive information but are used to transmit one or more documents containing this information should be marked to indicate the fact that sensitive information is contained in the documents transmitted. Transmittals to the NRC should be marked: "**Withhold from Public Disclosure in Accordance with 10 CFR 2.390.**" For Agreement State licensees, transmittals should be marked in accordance with equivalent Agreement State requirements. These markings should be placed at the top and bottom of only the first page of the transmitted document.

(4) the licensee's policies and procedures must address how access to the licensee's sensitive information is controlled.

Dissemination of sensitive information by licensees must be limited to individuals that have a "need-to-know" a licensee's security information to perform their job duties, and are determined trustworthy and reliable using criteria consistent with those requirements in IC 1. Access by licensee employees, agents or contractors must include both an appropriate need-to-know as determined by the licensee, as well as an appropriate determination concerning the trustworthiness and reliability of individuals having access to the information. Employees of an organization affiliated with the licensee's company, e.g., a parent company, may be considered as employees of the licensee for access purposes. Licensees should assure that individuals not authorized to receive such information do not overhear conversations relating to the substantive portions of the sensitive information.

(5) the licensee's policies and procedures must include acceptable methods for destruction of documents containing sensitive information.

Documents containing sensitive information should be destroyed by a method that will prevent reconstruction of the information. Documents may be destroyed by tearing them into small pieces or by burning, pulping, pulverizing, shredding, or chemical decomposition. (Note: sensitive information should not be sent to recycling without being destroyed first.)

(6) the licensee's policies and procedures must include use of automatic data processing systems containing sensitive information.

Sensitive information may be processed or produced on an Automated Information System (AIS) provided that the user is appropriately briefed on the proper procedures while using the computer system. Individuals should protect the information during use by maintaining control and by ensuring only individuals with the appropriate "need-to-know" have access to the information.

(7) the licensee's policies and procedures address removing documents from the licensee's sensitive information category when they become obsolete or no longer sensitive.

Periodic review of documents containing sensitive information to determine whether these documents should remain in this category is not required. However, this review is necessary only when specific circumstances require such action.

Definitions

Access Control - A means to allow only those individuals approved by the licensee, unescorted access to radioactive material.

Assessment - Licensee's capability to ascertain cause of alarm condition.

Approved Individual - Those individuals who the licensee has determined are trustworthy and reliable based on an appropriate verification.

Consignment - A package or group of packages of radioactive material that a licensee offers for transport in the same shipment.

Delay - To impede or hinder the progress of an intruder.

Dependable means to Transmit Information - Intrusion detection system and components which are used to detect, inform assessor(s), and summon responder(s), such that the system and components have continuous or alternate communication capability, even in the event of the loss of primary power or the loss of primary communication means.

Detect - To discover all unauthorized access to the radioactive material quantities of concern or device.

Immediately detect, assess, and respond - Detect, assess, and respond without delay.

LLEA - Any local law enforcement agency at the State level and below to include local jurisdictions.

Mobile device - A device containing licensed radioactive material that is mounted on a permanent base with wheels and/or casters for moving while completely assembled. Portable equipment means a device containing licensed radioactive material that is designed to be hand-carried, and stationary equipment means a device containing licensed radioactive material which is installed in a fixed location.

Monitor - Capability to observe and detect unauthorized access.

Need-to-know - means a determination, by a person having responsibility for protecting the licensee's sensitive information, that a proposed recipient's access to the licensee's sensitive information is necessary in the performance of official, contractual, or licensee duties of employment.

Plan with LLEA - A plan which is consistent in scope and timing with realistic potential vulnerability such that the LLEA acknowledges they can provide a timely response to thwart unauthorized actions.

Radioactive material quantities of concern - Licensed radioactive material that individually or in aggregation is greater than the quantities in Table 1. The unity rule is used to determine if the activity of aggregated sources of different radionuclides is greater than the Table1 quantities (see discussion following Table 1 of Appendix F).

Reliable and Trustworthy - An individual who is considered consistently dependable in judgment, character, performance, and does not constitute an unreasonable risk to the public health and safety.

Timely Response - Arrival of LLEA or armed responder to thwart unauthorized access and unauthorized actions associated with radioactive material quantities of concern or device.

Appendix F

INCREASED CONTROLS QUANTITIES OF CONCERN

The following table contains a list of radionuclides of quantities of concern which will be subject to the increased controls requirements. If your licensed activity requires radioactive source(s) as a single or sources located together (collocated) that may meet or exceed the quantities listed in the table below, please contact the Department for further information and direction.

Radionuclide	Quantity of Concern ¹ (TBq)	Quantity of Concern ² (Ci)
Am-241	0.6	16
Am-241/Be	0.6	16
Cf-252	0.2	5.4
Cm-244	0.5	14
Co-60	0.3	8.1
Cs-137	1	27
Gd-153	10	270
Ir-192	0.8	22
Pm-147	400	11,000
Pu-238	0.6	16
Pu-239/Be	0.6	16
Se-75	2	54
Sr-90 (Y-90)	10	270
Tm-170	200	5,400
Yb-169	3	81
Combinations of radioactive materials listed above ³	See Footnote Below ⁴	

¹ The aggregate activity of multiple, collocated sources of the same radionuclide should be included when the total activity equals or exceeds the quantity of concern.

² The primary values used for compliance with this Order are TBq. The curie (Ci) values are rounded to two significant figures for informational purposes only.

³ Radioactive materials are to be considered aggregated or collocated if breaching a common physical security barrier (e.g., a locked door at the entrance to a storage room) would allow access to the radioactive material or devices containing the radioactive material.

⁴ If several radionuclides are aggregated, the sum of the ratios of the activity of each source, i of radionuclide, n , $A_{(i,n)}$, to the quantity of concern for radionuclide n , $Q(n)$, listed for that radionuclide equals or exceeds one. $[(\text{aggregated source activity for radionuclide A}) \div (\text{quantity of concern for radionuclide A})] + [(\text{aggregated source activity for radionuclide B}) \div (\text{quantity of concern for radionuclide B})] + \text{etc.....} \geq 1$

Use the following method to determine which sources of radioactive material require increased controls (ICs):

- Include any single source equal to or greater than the quantity of concern in Table 1
- Include multiple collocated sources of the same radionuclide when the combined quantity equals or exceeds the quantity of concern
- For combinations of radionuclides, include multiple collocated sources of different radionuclides when the aggregate quantities satisfy the following unity rule: $[(\text{amount of radionuclide A}) \div (\text{quantity of concern of radionuclide A})] + [(\text{amount of radionuclide B}) \div (\text{quantity of concern of radionuclide B})] + \text{etc.} \dots \geq 1$